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Growth, Development, and Learning

Reviews of the literature for the period since the issuance of Vol. XX, No. 5, December 1950, and other issues dealing with similar topics.

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INTRODUCTION

THIS is the eighth number of the REVIEW dealing with the topics of growth and development, altho, on recommendation of the editorial board, the subject has been broadened to cover more aspects of the psychological foundations of education. Because research on motor development has been light since the last issue, this topic was omitted. The literature on physical development is, however, extremely voluminous and comes from a number of diverse professional sources. Problems of mental development also continue to interest many workers, but the research tends to be scattered among minor and unrelated topics rather than to follow major themes systematically. The literature on aging is still primarily concerned with changes which take place in physical and mental attributes rather than upon attempts at adjustment. Research on personality development continues to be of much interest, but the nature of the studies is being more and more affected by psychological theory.

This trend in research is recognized in this issue by a departure from the past, namely, the devotion of two chapters to psychological theory and its effect upon research. It is obviously impossible to treat either of these aspects adequately within the limits of our space, but at least it is a beginning. Applied fields, such as education, are inevitably affected by theory; and it is interesting to see an increasing number of studies stimulated by and based upon some systematic approach to psychology. Greater sophistication on this aspect of research may lead to some fresh research approaches to old and baffling problems.

STUART M. STOKE, *Chairman*
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CHAPTER I

Physical Growth

KAI JENSEN

THE term growth in both popular and scientific literature is used to cover a great variety of diverse and complex phenomena. It connotes all and any of these: reproduction, changes in dimensions, linear increase, gain in weight, gain in organic mass, cell multiplication, mitosis, cell migration, protein synthesis, and more (209).

Growth involves changes in size, shape, or function occurring in time. It may be studied at the molecular level, in cells, in a group of cells or tissues, in a specific organ or group of organs, or in an individual or population, or in some specific species (49).

Rates, patterns, directions, and causes of growth may all be affected by external and internal factors. These phenomena may be investigated at the documentary level of description or at the higher level of numerical formulation, analysis, and experimentation. Because growth is a process, research in this field can disclose not only the differences and similarities that exist, but also some explanation of how they come to be, together with possibilities of control.

Problems in growth vary with the developmental stage, and the growth potential may even become a liability as it does when normal growth in some tissue suddenly changes to uncontrolled, invasive neoplastic growth.

Because of the great number and variety of sciences which are interested in the study of at least some of the multiplicity of problems involved in understanding growth, and because of the fact that growth may be studied at such a diversity of levels by such a variety of methods and technics, the literature is tremendous.

Reviews of the Literature

Splendid reviews of the literature dealing with some of the specialized problems of growth (91, 178, 201) have been published.

Wells (201) has reviewed 385 publications dealing with embryonic growth, embryonic induction, differentiation, morphogenesis, development of function, ponderal growth, inhibition of development, developmental anomalies, postembryonic growth, genetic and morphological aspects of growth, growth equations, transplantation, tissue culture, regeneration, wound healing, nutrition, appetite, vitamins, effects of hormones, and inhibition of growth.

In the section on "Growth and Development" in *The Handbook of Experimental Psychology*, Carmichael (20), Hall (77), Nissen (143), Shock (168), and Sperry (174) reviewed the literature and made original contributions on the mechanisms of neural maturation, ontogenetic develop-

ment, the genetics of behavior, growth curves, and phylogenetic comparison. In the *Annual Review of Psychology*, Jones and Bayley (91) reviewed 38 publications on growth, development, and decline. In the *Proceedings of the Royal Society of London*, Haldane (75), Huxley (87), Medawar (125), Reeve (159), Yates (206), Young (208), and Zuckerman (209) critically discussed the accuracy of growth curves, relative growth and form transformation, transformation of shape, genetical aspects of size allometry, the place of statistics in the study of growth and form, the exact description of living organisms, and the pattern of change in size and shape respectively.

Blair and Burton (12), Merry and Merry (134), Reynolds (162), Sundgaard (182), and Thompson (188) have written new general texts on child growth and development which contain material on physical growth. Stuart and Reed (181), and Watson and Lowrey (199) have dealt with the general problem.

Gesell (55, 56) has written on developmental pediatrics and infant development, Forbes (43) on chemical growth, Leitch (108) has dealt with growth and health, and Osborn (148) with eugenics.

Several excellent sources of material on growth have been made available. Macy (120) has published a wealth of precise calculations for individuals and groups which should prove of value not only in nutrition research and child development, but also in the field of education. The data define growth patterns of individual children and make available computations of the original data of the Michigan study which many workers have desired.

Shuttleworth (171) has published 453 charts on growth and development designed primarily as a reference work for specialists in many different fields of child development. All of Section II is devoted to physical growth, but a large number of charts on physical growth will be found in other sections. The age range covered is from early childhood into adulthood. Another publication of Shuttleworth's (172) depicted normal changes in growth and development of boys and girls during the adolescent period by means of serial photographs.

Listings of current on-going research on growth and development are reported periodically by the U. S. Children's Bureau of the Federal Security Agency (40, 41). Another general source of much pertinent material is Cowdry's *Problems of Ageing* (27).

The Demographic Yearbook, 1949-1950 of the United Nations presented an interpretative report on world population trends over the last 30 years (195). It summarized current vital rates and age characteristics of the world by regions—population, births, deaths, marriages, and migrations.

Prenatal Development and Prematurity

Noback and Robertson (144) published data on the sequence of appearance of ossification centers for 136 human embryos during the first five

prenatal months. He found that most of the primary ossification centers appeared before the end of the fourth month and almost all of these between the seventh and twelfth weeks of embryonic life. He correlated his findings with published observations on human embryos in a series of tables.

Ellis and Lawley (36) correlated birth weight, crown-rump length, and head circumference in both full-term and premature infants with known gestational age. The correlations of birth weight and crown-rump length to week of gestational age in premature infants were found to be +.61 and +.60 respectively. In singleton premature infants of the same week of gestational age the correlation between any two of the three measurements was approximately +.80. In full-term infants the correlations were highest between crown-rump length and crown-heel length, both of which correlated highly with weight. The correlation was smallest in the case of head circumference. The investigators suggested standards of prematurity as a birth weight of less than 2500 grams, a head circumference of less than 33 centimeters (13 inches), and a crown-rump length less than 32 centimeters (12⅝ inches).

Reardon, Wilson, and Graham (158) pointed out that 46 percent of neonatal mortality is due to prematurity. They also pointed out that 57 percent of the mortality of premature infants occurs during the first day of life. Deviations of the premature infant in regard to respiration, renal function, regulation of body temperature, cardiovascular system, skeletal system, and gastrointestinal system were discussed.

Howard and Worrell (83) evaluated the intelligence and personality of 22 premature infants at ages 1 to 19 years. They concluded that except for the condition of the eyes, prematurity does not seem to affect the physical growth adversely. Prematurity per se was found to have neither a beneficial nor a detrimental effect on intelligence except that a more than average percent of premature infants suffered intracranial hemorrhage as a result of being born prematurely. No relationship between degree of prematurity (birth weight) and IQ was found. Over half of their cases were found to have made unsatisfactory or below average personality adjustment as judged by personality test results and information gleaned from psychologic interviews and case histories.

Steiner and Pomerance (176) found that for a given weight group, the fatality rate varied inversely with the length of the gestation period, particularly in the case of infants below 1500 grams in weight. Premature infants of multiple birth had a lower over-all fatality. Another study by the same authors (177) reported that an inverse relationship existed between the length of a premature infant's gestation period and the time required to regain its birth weight and continue to gain (weight lag period). Mortality was found to be 63.3 percent in prematures of less than 29 weeks prematurity, but 21.5 percent in those of 34 to 37 weeks prematurity, where weights for the two groups were almost identical, but gestational age differed. These results certainly indicate the inadequacy of birth weight as the sole criterion of prematurity.

Taback (183) studied the relation between birth weight and length of gestation in 9000 babies born in Baltimore during the period January to June 1949. Clinical records of 662 white and 200 Negro mothers were also studied. This investigation showed that if small mature babies are to be excluded from the prematurity classification, criteria additional to birth weight must be used. Recommended additional criteria were length of gestation and racial and national group neonatal mortality experience.

Methods of securing uniformity in hospital statistics on premature infants in New York City were discussed by Wallace, and others (198). They defined the premature infant in the conventional manner as any infant born alive or cared for in a hospital for prematurity, whose birth weight or earliest known weight was less than 5 pounds, 9 ounces (2500 grams). Actually, of course, prematurity should be more rigidly defined since the conventional definition in terms of weight makes no allowance for the fact that a small child may be perfectly normal and not really premature and a larger child premature in spite of weighing the 2500 grams. This means that criteria such as length of gestation and other considerations should certainly be brought into the picture. Undoubtedly much of the confusion concerning prematurity arises from this hopeless intermingling of "normal" and "abnormal" under the definition usually used.

Vital Statistics

Neonatal Deaths. Neonatal deaths have been studied by Adair (1), Calkins (19), Evans (38), Fagan (39), Geiger (54), Gibson and McKeown (60, 62, 63), Gibson and McGarvey (64), Guthrie (73), Lancet (104), Le Masson and Martin (109), McKeown and Lowe (119), Marshall (122), Parrot (151), and Robinson (164).

Gibson and McKeown (60) found that mortality rates correlate highly both with duration of gestation and birth weight. No babies born before the end of the thirtieth week gestation and who weighed less than 2 pounds survived. The risk of death is still associated with duration of gestation and with birth weight after the end of one month following birth, tho reduced greatly. The relationship between weight and mortality when gestation is constant is stronger than the association between mortality and length of gestation when weight is constant. There was a slight increase in mortality when the gestation period was unduly prolonged (for births of the same weight). Also for births after the same gestation period, the mortality rate was found to be slightly increased in the highest weight group (9 pounds and over).

Gibson and McKeown (62) also found that the stillbirth rate was higher in boys than in girls even when births in the same weight group were compared. In another study (63) these authors found that infant mortality increased with increasing birth order and decreased with maternal age and that in both cases the association was mainly the result of deaths from infections.

McKeown and Lowe (119) found that different causes of stillbirths have different sex ratios, and the proportionate contribution of each cause varies with the maternal age. They also found that the sex ratio of stillbirths increases as the duration of gestation increases from 49.8 at the seventh month to 57.1 at nine months and over.

The stillbirth rate is adversely affected by low social class and, broadly speaking, by advancing age after 25, by primiparity, and by increasing multiparity after the second child. The stillbirth rate is similarly affected by decreasing height (or more particularly, leg length) of the mother—a physical characteristic which in its turn is closely related to expenditure on food. Poor environmental conditions may well be more harmful to the reproductive function than more strictly obstetrical factors (104).

Mortality and Morbidity. Whereas in 1940-1942 the order of causes of maternal mortality in England was sepsis, hemorrhage, toxemia, and accident; in 1946-1948 sepsis was last in importance and toxemia had moved from third to first place. The maternal mortality rate was down to 1 per 1000 cases (103). Logan (111), and Webb and Weston (200) also reported on changes in causes of death in England and Wales.

In Louisiana between 1925 and 1949 maternal death rates decreased from 11.1 to 1.2 per 1000. Rates for nonwhite women were three times as great as for white. Puerperal toxemias and septicemias were still the leading causes of maternal mortality (109).

McCurdy (117) published a complete discussion of the medical, moral, and legal aspects of the Rhesus danger. Ranstrom (157), in a paper on the morbid anatomy of *erythroblastosis fetalis* and its relation to the Rh-factor, pointed out that if it be assumed that the endocrine disorders are a manifestation of the adaptation syndrome, and that they are the reason why the clinical symptoms do not begin till birth or afterwards, such assumptions reconcile the Rh-theory of the etiology of *erythroblastosis fetalis* with the pathological anatomy and the clinical cause of the disorders. Rh-isoimmunization would then account for the whole morbid anatomy of *erythroblastosis fetalis.*

Cardiovascular disease and cancer now cause more deaths among children 5 to 19 years of age in the United States than all the infectious and parasitic diseases combined (92).

Birth and Early Postnatal Development

Carter and MacCarthy (21) studied the incidence of Mongolism and its diagnosis in the newborn on the basis of figures of births from 12 hospitals over a period of a few years prior to 1949. They found the incidence to be 1.5 per 1000 of live and stillborn children and pointed out that since the condition is less apt to be wrongly diagnosed than missed, the true incidence may be higher. The incidence in mothers below 25 years was very low. In mothers over 40 years it was more than 1 percent. The 1947 incidence for the general population in London, England, and Wales was estimated at 1.6 per 1000.

Gibson and McKeown (59, 60, 61, 62, 63), and McKeown and Gibson (118) in their thoro studies of 23,970 births in 1947 in Birmingham, England, dealt with survival, duration of gestation, birth weight, weight related to economic circumstances of parents, and effect of changing family size on infant mortality. Several studies of the weight of newborn children have been published (51, 76, 88, 165, 183).

Gavan (51) tested Meredith's biological generalization, that typically first-born neonates are lighter than later ones, by studying birth order and birth weight in 42 live born chimpanzees. He considered length of gestation period, maximum weight of the mid-parent, age of mother at conception, and ordinal of birth. He rejected Meredith's generalization on the grounds that it does not consider that the problem is essentially one of multiple causation. Gavan's analysis showed that in his population birth weight increased with increase in gestation period and with increase in maximum weight of mid-parent. It decreased with increase in mother's age. Increase in birth order decreased the gestation period but had no direct influence on birth weight. Halevi, Bromberg, and Brzezinsky (76) studied Jewish newborn in Palestine over the 1940-1945 period and concluded that psychological as well as economic factors influenced the intrauterine growth of the fetus.

Illingworth, Harvey, and Jawett (88) measured weight, standing and sitting height, pelvic girth, and chest and calf circumference in 238 children five to eight years old and compared them with birth weights. Children of the lowest birth-weight groups were found to be smaller in all measurements than those of the largest birth-weight group.

Scott, Jenkins, and Crawford (165) analyzed the birth weights of 11,818 Negro infants and compared them with previous figures. The relatively higher birth weights for one group were attributed in a large measure to more favorable economic conditions during the period of observation.

Parfit (150) studied the weight gain made by 1282 babies in the first year of life. Serial weight records were analyzed in relation to sex and birth weight. It was found that the rate of growth was greater for boys than for girls, and greater for small babies than for large. These differences appeared to result from the fact that weight increment (actual amount of weight gained since birth) was a function of sex but not of size (i.e., birth weight) and, other things being equal, tended to be the same for all babies of the same sex between the ages of one month and one year.

Data on nine aspects of the normal physical growth and development of 32 male and 26 female children at four-week intervals during the first year after birth were published by Thompson (189).

Norval, Kennedy, and Berkson (145) made biometric studies of the growth of 4111 children of Rochester, Minnesota, during the first year of life. They found mean weights generally higher than for other published studies. Scott and others (166) also reported on the growth of infants during the first year of life.

Mayer (124) published a critical review of history and legend from Aristotle to the twentieth century dealing with sextuplets and higher multiparous births. Nichols (142) published a paper on quintuplets and fecundity in which he reviewed 52 cases back to the year 1648. The cases involved 260 persons, of whom 127 were males and 133 females.

Growth—Anthropometric Measurements

Muhsam (137) correlated height and weight in early childhood for 147 male infants and found that children who are relatively big at a given age grow, during a given subsequent period, less than children who are relatively small at that age and that this condition held during the first four years of life. He found height at birth more closely connected with subsequent height and weight than weight at birth, and that children who are relatively tall at a given age subsequently grow less than those who are relatively small at that age.

Patrick (152) compared the heights and weights of Brisbane children in 1950 with measurements made in 1911 and found a considerable increase. He also found that at all ages in both sexes the children of professional fathers were taller and heavier than those whose fathers were of lower socio-economic status.

Moraut (135) studied secular changes in the heights of British people. He used measurements of men compiled on occasions between 1845 and 1948, a period which included about 2 million subjects between 18 and 50 years of age. He concluded that men were taller on the average at all adolescent ages than their ancestors were two generations ago, but that they become fully grown at a younger age and their maximum height is the same as that of their ancestors who matured more slowly. These conclusions were based on idealized age curves of mean heights for the general British male population about 1880 and about 1945. He further concluded that, because of the earlier maturity, the decline in adult life began earlier and so, after the early twenties, the people were shorter on the average than their ancestors.

Trotter and Gleser (193) studied cadavers ranging in age from 19 to 91 years and found a statistically significant decline of stature with age in each sample. They also reported on the trends in stature of American whites and Negroes born between 1840 and 1924 (194). The investigators raised the question as to whether changes in stature are progressive or cyclic.

Pirrie (155) found that between 1938 and 1949 the average height of London school children had increased by about 2 centimeters (¾ inch) and the average weight by about 0.8 kilograms (1¾ pounds).

Seils (167) found little or no relationship between the gross motor skill performance (running performance, balance, agility, jumping, throwing, striking, and catching) of primary-grade children and their age, height, or weight. A slight interrelationship was found between skeletal maturity and motor performance.

The weight-age and height-age curves for South African children were found to run consistently below those for European children with the disparity as regards weight becoming slightly more marked as age increased (204).

Cotellessa, Maranzana, and Soleri (25) reported on auxological research on 3500 girls from 6 to 18 years of age, and Cotellessa, Corradi, and DeMatteis (24) on 4000 boys for 6 to 18 years of age. Dossing (30) published average values for the weight-height-age ratio in boys and girls of school age.

Greulich (71) made an anthropometric and X-ray study of a representative group of children in Guam in the summer of 1947. He found that they were significantly retarded in standing height, sitting height, weight, and in their skeletal development as compared with a group of well-circumstanced white children of the same age in the United States. Guamanian boys were found to be relatively more retarded than girls in growth and skeletal status. Gavan (53) critically evaluated Greulich's methodology. Another study of children in the post-war world was made by Bacchetta (6) on the Italian child up to 1949.

Hahn (74) studied the relationship between blood pressure and height and weight and body surface area in schoolboys ranging in age from 11 to 15. Simple myopia in schoolboys in relation to body height and weight was investigated by Johansen (90).

Weight

Brozek and Keys (17) found that the concept of "normal" body weight defined actuarially, tends to obscure the profound changes taking place in the process of aging. Not only is there an additive accumulation of body fat but also, very likely, replacement of some of the muscle (and other "active tissues") by fatty tissues. They pointed out that in view of the variation in the composition of the body at the same weight and the differences in the metabolic properties of muscles and the deposited fat, the expression "per kg. of body weight" may lead to erroneous conclusions. The body weights of both of the groups they studied (19 to 25 years and 45 to 55 years) were "normal" but they differed markedly in the composition of the body as indicated by the amount of body fat measured from skin folds and estimated on the basis of specific gravity.

Massler and Suhrer (123) found chest circumference at the xiphoid level a very reliable index of weight when combined with height. Calf girth bore a specific and very close relationship to body weight, regardless of age. This measurement was also found to be directly and closely related to body build (somatotype) of the individual. They used 531 children 5½ to 17½ years in age and in maximal health and good nutritional condition as subjects. Gharpure and Jhala (58) studied the relationship of the body weight to the weight of the brain.

Armstrong, and others (4) studied the relation of obesity to health and disease. They defined obesity as a deviation of 20 percent or more

over the ideal weight. They concluded that obesity makes pregnancy more difficult and both mother and child are affected (diabetes). They also concluded that obesity should be attacked as a public health problem because of its extent and the fact that it shortens life and is an etiologic factor in several diseases.

The present status of the obesity problem, diet management of obesity, thyroid medication, and appetite depressants were discussed by Barborka (8).

Body Size

Ellis (35) outlined the phases of postnatal growth and showed that they do not consistently correlate with chronological age. He emphasized the importance of a maturity grading during the period of growth and pointed out that the Education Act and legislation for the protection of employed juveniles in England do not evidence any awareness of this, but rely too much on chronological age.

Lawson (107) described eight measures of body size on girls of two racial groups living in Compton, California. Measurements of infants at birth were described by Low (113).

Meredith and his associates have dealt with various aspects of body size and form in a series of publications (127, 128, 129, 130, 131, 132, 133). He arranged data in order and determined the 10th, 30th, 70th, and 90th percentiles for body size norms for children four to eight years of age (127). Fourteen previously characterized groups of United States white school boys were compared with white boys of elementary-school age living in the Northwest region of the United States who had been assessed by anthropometric methods (129). Meredith (128) also published a synthesis of 12 studies concerning present knowledge on the association between socio-economic level and body size for the period of middle childhood in the United States and London. He concluded that information presently available for this group indicates that North American boys of the indigent class probably are more than 2 inches shorter and 5 pounds lighter than those of the wealthy class and that girths of trunk and limbs, breadth of shoulders and head, and length of extremities were greater in children of the professional and managerial occupational groups.

Meredith and Culp (130) found that for the age range from four to eight years in boys there was a gradual decrease in the stockiness of stem, stockiness of upper and lower limbs, and over-all stockiness of the body. They found low correlation coefficients between stem stockiness and lower limb stockiness (+.26 to +.53) and only moderate correlation coefficients between stockiness of upper and lower limbs (+.68 to +.77). A companion study on girls uncovered central tendency values indicating that girls become more slender in body-stem over the age period from four to seven years and more slender in upper and lower extremities of the age range from four to eight (133).

Meredith and Goldstein (131) studied body size of North American children of Mexican ancestry from birth to 17 years during the temporal span between 1924 and 1951. Differences in means associated with geographic region, socio-economic level, and secular period were found. They suggested that research is inadequate or lacking on all problems of body size in the age period one to four years, dispersion of measurements of body size at most ages, and individual variations in growth pattern and growth rate for all dimensions.

Meredith and Meredith (132) published annual increment norms covering the age period from four to eight years for 10 measures of physical growth. They described the source and size of their sample, the anthropometric procedures followed in the collection of the basic data, and their methods of increment derivation and norm construction. Illustrations suggesting some applications of the norms were given.

Newcomer and Meredith (140) used 11 measures of body size on a sample of 102 15-year-old white boys as a part of a long-term research to study physical growth of children in Oregon. They compared their results with those of other studies.

Steroid Phase of Growth

Gallagher (45, 46), Stolz and Stolz (179), and Reynolds and Wines (161) have published good general discussions of growth and development during the steroid phase of growth. Precocious puberty has been dealt with in 37, 110, 136. Engstrom and Munson (37) described two brothers who exhibited precocious sexual and somatic development and contrasted them with a third brother, intermediary in age, who showed no developmental abnormality. Another boy who also was precociously developed and who suffered from adrenal cortex overactivity was also studied. In examining the sequence of the maturity phenomena, it was seen that the general picture of growth in height and weight was like the adolescent "spurt" in growth of normal boys except for its occurrence at an abnormally early age. The skeletal and muscular systems responded in a fairly normal manner to accelerated growth factors, but some other phenomena, such as the 17-keto-steroid secretion, were below that of normal boys of comparable biologic age. Teeth and the central nervous system were largely unaffected by the influences which caused precocious puberty. Normal pubescence did not occur.

Lloyd, Lobotsky, and Morley (110) examined five cases of probable hypophyseal precocious puberty of constitutional origin and one case of hypophyseal precocious puberty associated with a hypothalamic lesion. He briefly discussed the physical alterations involved.

Garn (49) claimed that contemporary American children sprout breast buds, pubic hair, axillary hair, and attain menarche from one to two years earlier than was formerly true. He also pointed out that this was the case in England, except that earlier puberty there is thought to be

accompanied by an earlier cessation of growth, so that English children mature earlier and stop growing earlier.

Evidence purporting to show that physical constitution must influence reaction patterns was published by Bayer and Reichard (10). They studied 42 women at the Stanford Androgynic Clinic and classified their subjects into seven androgynic groups: hyperfeminine, feminine, hypofeminine, hypobisexual, bisexual, masculine, and disharmonious. In addition they used intensive interviews, administration of Stanford Binet vocabulary, and 10 of the TAT pictures. Where sexuality was weak, they reported a tendency toward the renunciation of personal relationships and oral gratification. A masculine direction in androgyny favored muscular activity and independence.

Bayley (11) worked with a group of normal adolescents and found the androgynic variables in body form to be significantly related to strength and in some degree to weight. She also found the hypomasculine boys to be significantly taller than the hypermasculine boys. Intelligence was found to bear no relation to sex variable either physical or mental, with the possible exception of the boys' IQ's with Kuder masculinity-femininity scores. She concluded that tho there were some tenuous indications of relation between the masculine and feminine in physique and interests, the outstanding fact in these adolescents, in particular the girls, was that the two series of variables were largely independent of each other. She concluded that somatic androgyny was only one of a multiplicity of factors which may influence the direction of a person's interests. Furthermore, such relationships as did occur were not in the expected direction, along a single masculine-feminine continuum. The Kuder MF scores of the cases in the atypical somatic classification were accounted for by such factors as the age of the subjects and their culturally-conditioned emotional attitudes toward their own physiques.

Shuttleworth (171, 172) has published both a graphic atlas of the adolescent period and a pictorial atlas. Both of these publications should prove of great value to workers in the field as very fertile sources of information. Stolz and Stolz (179) have also published a volume which contains 113 tables and over 200 gross profile charts, histograms, and diagrams. It also contains photographs which show the progressive development of several boys involved thruout the period of this study. In addition there is a detailed case history of one of the boys demonstrating the relationship between physical and social development. Waite and Rothschild (197) have published a review of normal growth and development in the adolescent for the pediatrician. Latham (106) evaluated the relationship between pubertal status and leadership in junior high-school boys. Another study of this sort was that of Hanley's (78), which was concerned with physique and reputation of junior high-school boys. Hanley found associations between physique and reputation which seemed congruent with Sheldon's hypothesis insofar as the kinds of relationships were concerned. However, Hanley's relationships nowhere approached the

magnitude of those Sheldon reported between temperament and physique. Murray (139) advocated the assessment of physiological age by a combination of several criteria: vision, hearing, blood pressure, and muscle force.

Endocrine Regulation of Growth

There has been an extraordinary output of literature in the field of endocrinology. Wilkins' (203) book on the diagnosis and treatment of endocrine disorders in childhood and adolesence dealt with the relationship of endocrine factors to growth and development, endocrine study and diagnosis in general, and the major endocrinopathies (except *diabetes mellitus*). One excellent feature of this publication was the vividness with which the author displayed the extremes of normal variance of adolescent development.

Kountz (100) found that estrogen and androgen could revitalize certain tissues associated with age. Along with the direct effect on these tissues he found some retardation of both the mental and the physical decline.

Caldwell and Watson (18) studied the effects of six months of sex hormone administration in aged women. They used psychologic tests as a criterion and found improvement in memory and intellectual functioning as well as a change in the motivation level of the patients. They did not discern any significant changes in pattern of interests and attitudes. Memory was definitely enhanced, particularly in respect to meaningful and logical material. Over the six-month period the experimental group made distinct gains in the learning of new material, even when this required the breakup of old associations which had long held sway.

Body Segments and Tissues

Peacock (154) published work dealing with the prenatal development of intervertebral discs in man. In addition to the data of prenatal development, he presented data on intervertebral discs at various ages following birth (153). Descriptions were given of the tissue changes taking place in the structural components of the human intervertebral discs from birth to 80 years of age.

Tirman and Hamilton (190) published measurements of the thorax and its viscera and indicated the changes which occurred with age in apparently normal men. They found some features which remained unchanged.

The embryonic development of the human knee joint was described by Gray and Gardner (69), and O'Rahilly (147) also published some work dealing with the early development of the human knee joint.

Lombard (112) studied the development of the calf of the leg by means of a roentgenographic technic. The breadth of the tissues in the calf of the leg was found to vary with the age, sex, and body build of the child. Norms were presented by which the measurements for individual children

could be compared with those for a large group. They concluded that it is important to differentiate weight into its component parts of muscle, bone, and fat. This they attempted to do by measuring the thickness of the skin and subcutaneous tissue and the breadth of bone and muscle on A-P roentgenograms of the calf.

Jager and Moll (89) studied the development of the human *triceps surae* muscle in embryos, stillborn fetuses, and adults. They paid special attention to the development of muscle architecture and skeletal attachments.

Duggins and Trotter (32) studied the age changes in head hair from birth to 14 years of age. Trotter and Duggins (192) also published work dealing with age changes of head hair from birth to maturity. Garn (48) pointed out that the many differences in methods of studying hair texture make comparisons of published ratings unwise. Cranial growth was studied by Pankow (149). Gunther (72) studied the developmental changes in jaw length. The head-jaw-index is a measure of jaw length as a percent of the distance (vertical) from the highest point on the head to the upper edge of the ear opening. It increases rapidly during prenatal development.

Fulton (44) compared dental caries in New Zealand and the United States on the basis of decayed, missing, and filled teeth for children aged 12 to 14. Garn and Coenraad (50) found tooth emergence markedly advanced in Aleutian Aleut children as compared with whites. They also found no growth retardation or stunting as a result of the wartime experiences of this group. This was especially true for the younger children who were most advanced in tooth emergence and who exceeded their expected stature markedly. These children suffered markedly during the war. Mellanby and Mellanby (126) found slight improvement in dental disease among 14-year-old children in England in 1947 and 1950. Woods (205) studied changes in width dimensions between certain teeth and facial points during human growth. Andrew (2) compared age changes in salivary glands in man and the rat. He found a very great degree of fatty replacement in old age in the case of the parotid gland and less in the submandibular gland. Accumulations of lymphoid tissues were as common in the salivary glands in old age in man as in the rat. This increase in the percentage of fat was believed to be a destructive one.

Covell (26) made histologic examinations of the cochlea of the ear in aged subjects with severe nerve deafness. These failed to demonstrate a close relationship between structural changes and the degree of hearing loss.

The development of the nervous pathways in the developing human labyrinth was studied by Shute (170). Keeney (96) published developmental data on the eye. The brain was studied by Connolly (23). For the most part he made a detailed presentation by description, photograph, and line drawing of the fissural pattern and convolutions of the primate brain. Hogue (81) cultured brain cells including neurons and oligendroglia *in vitro* after death of the individuals. She worked with 121 brains of fetuses from 16 millimeter C-R length to stillborn infants and brains from

two infants that lived one day and five months respectively. Some of the tissue cultures studied were made long after the individuals were pronounced dead. The time elapsing from death to the making of the tissue cultures varied from less than one hour to nine days. Some of Hogue's cultures survived more than 323 days. This proof that brain cells may live after "death" calls for drastic revision of some concepts concerning the nature of brain injuries and general growth and development of the central nervous system.

Sperry (174) reported on the studies which have been made of neural maturation. Young (208) published work on the growth and plasticity in the nervous system. He tackled the question of what happens in the nervous system at each presentation of the learning situation.

His experiments showed that there may be large increases and decreases in the size of cells and fibers over periods of days, weeks, and months. Because of this he concluded that it is not unplausible to suppose that at the level of the dimensions involved in synaptic function, changes of much smaller amount could occur in the periods of seconds, minutes, hours, and days that are involved in the establishment of a learned response. He further concluded that the changes during functioning could be sufficient to alter the probable course of excitation within the nervous networks and thus provide a stable basis for learned reactions.

Edwards (34) studied differences in the distribution of subcutaneous fat with sex and maturity. He found that up to puberty the sexes are similar in the pattern of fat distribution and that pregnancy and obesity have little effect on the relative distribution of fat.

Bliss and Young (13) analyzed the heart measurements of growing boys. They made measurements of the transverse diameter of the heart from periodic roentgenograms of growing boys and examined them statistically in relation to measurements of body size. They found that heart diameter could be predicted more efficiently from body weight than from either height or a combination of height and weight.

Tähkä (185) published data on the weight of the thyroid gland in 244 children of zero to 2 years of age. She found that the thyroid gland decreased to about 68 percent of newborn weight at two to three months. There were no sex differences. Tähkä (184) also studied the weight of the thymus of 309 children, finding again no sex differences and no discernible effect of age on size.

A direct correlation between the weight of the thyroid gland and age and body weight of the animals they observed was found by Mulligan and Francis (138). No such relationship was found between the weight of the parathyroid gland and the age and body weight.

Andrews (3) made a histological study of 66 prostates removed from infants and children between the twenty-fourth week of fetal life and 13 years of age. He discussed the possible etiology of these changes and their relationship to benign hypertrophy.

Areolar size was studied by Garn (47) during the steroid growth phase in 147 children from 9 to 20 years of age. He found areolar size genetically limited and independent of size. Furthermore, he found no increase once the mature stage is reached.

Wagner (196) dealt with the nonendocrine deviations from the normal pattern of osseous development. Skeletal age in diabetic children was dealt with by Hernberg and Herkel (80). They found no definite relationship between the duration of disease and the abnormal variations.

Somatotypes—Body Build—Constitution

Barbara (7), Bauza and Solovey de Milechnin (9), Dupertuis (33), Hanley (78), Howells (84, 85), Hunt (86), Newman (141), Reynolds and Asakawa (160), and Spray and Widdowson (175) have all reported research dealing with somatotypes.

Dupertuis (33) reported that anthropometric measurements on the living were only moderately successful in demonstrating anatomical differences between extreme somatotypes and that they were of questionable value in differentiating between the midrange and closely related somatotypes.

Howells (84), Hunt (86), and Newman (141) have all raised important questions about Sheldon's somatotyping. Howells (84) raised questions as to the essential nature of the components, the nature of the genetic element, developmental latitudes and determinants, and the extent to which the accepted phenomena grew out of the hypothesis itself.

Hunt (86) concluded that it was safer to assume that a body build photograph represented a momentary state in the somatic biography of an individual than to attempt to find ratings of body build which were constant thruout life. An unimpeachable basis of constitutional knowledge may some day be provided by the arduous study of photographs at successive stages of the human life cycle and the measurement of trajectories of individual growth and aging.

Newman (141) investigated the problem of stability in body build by examining a series of some 40,000 individuals photographed by the United States Army and typed at Harvard University. The age groups from 18 thru 35 years were analyzed for percent of occurrence for each rating, mean component scores, summation of component scores, product-moment correlation coefficients, and partial correlation coefficients on a year by year basis. Comparisons of central tendency and statistical association on series typed by the Hooten system and series typed by the Sheldon system showed large differences between investigators. These differences posed problems of comparability of technics.

Reynolds and Asakawa (160) used roentgenograms of the leg in 100 men and 100 women, ages 19 to 70 years, to measure breadth of fat, muscle, and bone. They also measured weight, height, and calf circumference, took photographs, assessed androgyny on selected cases, and picked out extremes of endomorphy, mesamorphy, and ectomorphy. Intercorrelations

between tissue breadths were low. Tissue breadths correlated significantly with weight, but not with height. Age was not an important factor in their series, as measured by the correlation coefficient.

Reynolds and Wines (161) studied the relation of body build and growth progress in weight and height to sexual maturation, basing their conclusions on 706 semiannual examinations of 59 boys. Their observations were chiefly descriptive and classificatory in nature.

Kahn, Brown, and Goldring (93) made a Wetzel Grid analysis of 157 children in their initial episode of acute rheumatic fever and found definite growth failure in this series as compared with the distribution of 3366 grade-school children. Marked improvement in growth and development occurred in 130 of the 157 rheumatic children in follow-up studies. (The 130 were the only cases where follow-up studies were available.)

Special Environmental Effects

Operation on the Brain for Feeblemindedness. The Carotid-Jugular-Anastomosis operation was designed to increase cerebral circulation in order to improve the mental abilities of retarded children as well as to produce other beneficial effects in children and adults suffering from some such physical disabilities as convulsive disorders and sensory-motor impairment. In one of the most complete reports to date Kessler (97) evaluated the results of the C-J-A operation on 33 children and concluded that there is virtually no evidence substantiating the effectiveness of the operation.

Socio-Economic Status. Douglass (31) made a national survey of social class differences in health and survival during the first two years of life and found a distinct social gradient.

Bransby and Hammond (15) compared groups in respect to socio-economic status and clinical nutritional categories, and the "good" groups in each case showed quite different characteristics. The good socio-economic group excelled mainly in length measurements but had less fat; the clinically good groups excelled in girths and fat. They concluded that physical type evidently needed to be taken into account within the social and clinical groups.

Comparisons of actual and predicted weight, together with fat measurements were deemed promising, but they believed that no one method offered a real solution, the safest approach being to use all available methods in conjunction.

Nutrition. Macy and Hunscher (121) studied calories as a limiting factor in the growth of children. They found that invisible growth occurred with progressive maturation and could be measured indirectly by various technics: (a) by the absorption and storage in the body of structural and functional constituents obtained from food eaten, (b) by basal metabolic rate determinations, (c) by other physiologic measurements, and (d) by roentgenographic recordings.

Bransby and Hammond (16) made an interesting study on the relia-

bility of the clinical assessment of "nutritional state." One hundred children were examined by nine clinicians and a school nurse. Nothing was known by the clinicians of the children's backgrounds. The agreement among the clinicians was rather poor. Moreover, when some children were rated twice by the same clinician, considerable variation (from 4 to 37 percent) occurred.

Widdowson (202) studied children ranging in age from 4 to 14 years in two German orphanages to ascertain the effect of emotional climate upon physical growth. She found that psychological stresses due to harsh and unsympathetic handling seriously curtailed growth rates.

An interpretative review of 1008 publications dealing with maternal and infant mortality, specific nutritional factors in maternal and infant health, prematernal, prenatal, and postnatal care was published by Toverud, Stearns, and Macy (191). They repeatedly emphasized the importance of social factors but did not analyze the kinds of social influences which lead to death.

Starvation. Several excellent and extensive studies of starvation are available (98, 114, 173).

Keys and his co-workers (98) studied experimentally the effect of controlled semistarvation upon human body structures and tissues. Fourteen bodily measures were taken. The effect of semistarvation on growth and development was thoroly surveyed in Volume 2. They also reviewed the general literature and offered evidence that dental disease (caries) was less frequent in semistarved populations and that semistarvation had no influence on the duration of pregnancy. Labor averaged 5 hours shorter in better-fed mothers, and there were fewer congenital malformations. The amount, timing, and rate of postnatal growth in height and weight were found to be adversely affected. Weight was not handled as a discrete or unitary measurement in this study but was broken down into its basic components. McCance and his colleagues (114) made a very extensive study of undernutrition in postwar Wuppertal, Germany. Smith and Woodruff (173) studied deficiency diseases in Japanese prison camps where they were inmates. All three studies showed that, at least within broad limits, no irreversible changes occurred. These three studies give a clearer insight into the effects of semistarvation than any other publications to date.

Studies conducted in Britain, Holland, Switzerland, and France showed little or no effect on height and weight of children as a result of a decrease in food supply. Such delays in growth as did occur seemed completely reversible. In the case of France it was claimed that "microclimatic" differences were much more stable than differences due to undernourishment (146). This is in agreement with findings from studies in Germany and Japan (105).

Fate of Transplants

Fleming (42) reported that transplants of human tooth germs grew better in guinea pigs than rabbits. The fact that tooth germs survived

intraocular transfer offered a new approach to further studies of their growth and development.

Harris and Jacobsohn (79) studied functional grafts of the anterior pituitary gland and found that such tissue obtained from immature donors and grafted into adult recipients showed hastened development. Similar tissue obtained from adult male donors and grafted into adult female recipients proved capable of maintaining normal oestrus cycles and pregnancy.

McCay and others (116) pointed out that healing of wounded tissue which is slowed in older individuals proceeded at the same speed as for younger individuals if the tissue was excised and permitted to heal *in vitro*.

Some of the outcomes of transplantation experiments raised the basic question of the importance of knowing more about the chemical and endocrine components of cell environment. What caused the speedup of the development of tissue transplanted from a younger to an older animal? What caused the slowdown in the reverse situation? What produced optimal *inter* and *intra* organ development?

Methodology and Technics

The merits of the pure longitudinal, the mixed longitudinal, and the cross-sectional growth studies with the necessary inferences as to the statistical handling of each type of data were thoroly discussed by Tanner (187). He pointed out that the ratio index was one way of describing the growth of one part of the body relative to another whereas in the allometry equation, multiplicative velocities of two dimensions were compared. Tanner also discussed the relationship between allometry during growth and the factor analysis of adult physique.

In another publication Tanner (186) discussed the theoretical background and limitations of current standards available for determining whether or not a child is growing normally. He pointed out that the limits of normality are usually fixed arbitrarily according to the purposes at hand with misclassification resulting. The merits of standards in terms of percentiles and in terms of deviations were discussed and various standards of maturity were reviewed. The limitations in using standards for distance as tho they were standards for velocity were mentioned. A suggested system of standards was presented for experimental trial, and various measures were considered in relation to age and to each other irrespective of age. The difficulty in interpreting multiple tests of this sort was stressed.

Zuckerman (209) discussed in general the measurement of growth and form, Haldane (75) the accuracy of growth curves, Huxley (87) relative growth and form transformation, Medawar (125) form transformation, Reeve (159) genetical aspects of size allometry, Yates (206) the place of statistics in the study of growth and form, and Young (207) the exact description of living organisms. These papers dealt with the topics indi-

cated at a very high level. Stuart and Reed (181) discussed certain technical aspects of longitudinal studies of child health and development. They considered the question of how to interpret over-all growth of the body in terms of the growth of different types of tissues and also how to summarize the facts concerning growth over a period of time. Stuart (180) dealt with the problems in applying knowledge of child growth and development.

Greenberg and Bryan (70) used the method of co-variance in studying physical growth and found it was equal to doubling the number of observations. They recommended that the technic of co-variance be employed in the analysis of anthropometric characteristics of school children. They considered the problems involved in obtaining physical measurements in the optimal age group for study and the physical measurements which might be worthwhile indices for adoption.

House (82) used the questionnaire technic to ascertain the opinion of 49 radiologists as to the age limit of apparently normal six-year-old children. Little agreement as to the lower skeletal age limit for normal six-year-olds was found.

In another publication, Howells (85) stressed the need for further analytical technics especially statistical ones in anthropometry. He discussed factor analysis as one such possible technic. Keen (95) proposed a program of standardization for the technic of cranial capacity determination. Koch and Kaplan (99) presented a method by which the trend in body development (height-weight) of children could be found for smaller numbers than the Wetzel grid method, for example, could handle.

McCance and Widdowson (115) have published a method of breaking down the body weights of living persons into terms of extracellular fluid, cell mass, and fat, together with some applications of their method to physiology and medicine. They thought their method would help to solve a number of physiological, nutritional, and medical problems and throw light on development during childhood and adolescence.

Spray and Widdowson (175) studied the concentration of protein, water, fat, sodium, potassium, calcium, magnesium, phosphorus, iron, copper, and zinc in the bodies and livers and spleens of rats, rabbits, cats, and pigs from birth to maturity. Mice and guinea pigs were also studied during the early part of their lives, and the results were compared with corresponding figures for man. They concluded that Moulton's conception of chemical maturity is not a true generalization and requires elaboration if it is to be applied in detail. Chemical growth of man was dealt with by Forbes (43) and Macy (120). Forbes pointed out that from mid-fetal life to the period of young adulthood, chemical growth as regards Na, K, and H_2O proceeds in a way that it conforms to the differential growth equation $y = bx^k$.

Gesell (57), Price (156), and Rife (163) have all considered methodological problems in connection with the co-twin control method. Price

(156) in particular carefully considered primary biases in twin studies and critically discussed the use of the twin method in studying the nature-nurture problem. The segregation of genetic factors from intra-uterine factors may be accomplished in part, at least, by using embryos which are obtained by transplantation procedures.

Garn (49) has pointed out that both older and more recent investigations agree that the nature of the injurious stimulus is of less importance than the time of its application. Other studies indicate that there seems to be a definite trend toward the "range of normality" concept as contrasted with fixed points for normality (68, 186, 187, 203).

Krogman (101), has suggested a program of cooperative research involving physical growth with orthopedics, pediatrics, dermatology, ophthalmology, obstetrics, general medicine, medico-legal research, aero-medical research, orthodontics and prosthetics, oral surgery, and children's dentistry. When interdisciplinary approaches are used the experimenter often accepts at face value instruments outside his field which are too imperfect, or attaches too great significance to them.

Blum and Fieldstell (14) have objected to the use of broad descriptive terms such as "making progress" with respect to children under treatment. They presented a method of charting the rate of a child's progress concurrently with treatment so as to furnish a basis for determining the extent to which treatment was effective. They believed their technic could be used with almost any kind of retardation or disability. Gordon (68) dealt with the problem of determining which diseases in children warrant treatment. He listed a number of "disorders" which usually do not require treatment because they are innocuous (enlarged tonsils, orthopedic defects, phimosis, constipation, innocuous cardiac murmurs, etc.). He criticized the perfectionists' definition of health as well as the functionalists' definition.

Ciocco and Ring (22) discussed criteria for field study and presented them in outline form. They were concerned with objectives, the validity and reliability of measuring instruments, control groups, staff qualifications, and follow-up procedures. DeToni (28, 29) proposed a simple auxometric grid for the evaluation of human growth and its application in scientific and clinical areas.

Dupertuis (33) tried to discover just how different groups of extreme physiques are in terms of conventional anthropometric measurements and reached the conclusion that such measurements were only moderately successful in demonstrating anatomical differences between extreme somatotypes and were of questionable value in differentiating between the mid-range and closely related somatotypes.

Massler and Suhrer (123) measured weight, height, chest, neck, and calf circumference and made subjective estimates of somatotype on 304 boys and 227 girls aged from 5½ to 17½ years. They presented a channel diagram similar to the Wetzel Grid for the determination of body type in children on the basis of the constant relationship between height and calf

girth which they found. They claimed that their method of channelization had the advantage of indicating inherent or "normal" body build rather than the "present status" indicated by the Wetzel Grid.

Gavan (52) found considerable variation in 62 anthropometric measurements taken by six teams on five subjects. Gobessi (65, 66, 67) suggested an auxometric reticulum for graphic representation of growth and also some methods for the automatic application of the DeToni Auxological Classification. Ashley-Montagu (5) has presented a number of methods used in anthropometry.

Growth Curves and Growth Formulas

The primary use of a growth curve is to estimate the amount and rate of growth. It is also used to study the effects of diet, the effects of hormones, seasonal variation, equivalence of growth among different species, and problems of relative growth (49). In constructing and using growth curves they must be disentangled from "frequency distribution" in size. Shock (168) has critically evaluated the current literature dealing with growth curves. Growth equations expedite the analysis of growth rates, allow comparisons of modes of growth of related organisms, and make it possible to frame inductive "laws" of growth. The allometry equation deals with differential or relative growth. Empirical formulas resulting from fitting to the data are descriptions of those data, and extrapolation is perilous. Moreover equations derived on a priori grounds may obscure important factors. No one biological law underlies growth equations (169).

A new method of estimating differential (allometric) growth gives greater accuracy than the older methods (75). By means of "shape parameters" (ratios, if the growth is isometric) and allometric constants, growth profiles of an organism may be constructed.

Medawar (125) considered the measurement of transformation of shape. His method was analytic and described continuous changes of shape. It did not apply where changes of complexity were involved, and he pointed out that to date no adequate method for describing change of complexity has been produced.

On the basis of height and weight measurements of 440 healthy children in a favorable environment who were followed for six years or more, Kallner (94) emphasized the fact that deviation of a child from the "channel" on a grid need not imply disorder of health or permanent deviation from normal physique. Developmental deviations which appeared to be pathological in the light of the grid method were not at all rare and might easily lead to diagnostic, prognostic, and therapeutic errors. Kallner preferred to use DeToni's auxometric triangle.

Length of Life

Lancet (102) has pointed out the lack of any substantial progress in the extension of the span of life for the over-sixties as one of the failures

of modern medicine. The elimination of cardiovascular renal disease would, it seems, increase the expectation of life at 60 by 8.88 years; the elimination of cancer would effect an increase of 1.11 years; and the elimination of accidents and infectious disease would increase life expectancy of 0.35 years each.

McCay (116) has summarized experimental work indicating that retarding the rate of growth during the early development of the child tends to increase markedly the life span. The relationship between early development and aging certainly needs to be further studied and studies of younger and older age groups need to be better integrated.

Increasing importance has been attached to the question of tempo of growth after the fourth decade of life (49). It is known that between species the rate of maturation and length of life are closely related. Is that true within the human species as well? Evidence that longevity and the tempo of growth are inversely related is so far indirect. Direct evidence must be furnished by longitudinal studies.

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CHAPTER II

Development of Mental Functions

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THE chief problems and research trends in the study of mental development were defined, as of 1950, in the previous growth and development numbers of the REVIEW (46, 107). Current studies have shown a sustained interest in each of these topics, with special attention to certain critical issues. Renewed effort is being directed toward the analysis of socio-economic factors in relation to intelligence and achievement. Age changes in mental abilities, and responses to the same tasks at different ability levels, have continued to receive marked emphasis.

Some interest in the effect of glutamic acid on intellectual development was reflected in the previous review, and research on this relationship has gained momentum; however, in view of the negative results of the majority of these studies, further inquiry in this particular area may be expected to diminish.

The examination of mental-physical relationships has continued; of particular note in this connection are recent studies on the effect of prenatal and natal conditions on later mental status. If we are to judge by the number of publications, the relationship of interests to abilities is no longer a prominent topic, but much still remains to be done in analyzing the role of emotional factors in mental functioning, and studies in this area have opened a number of promising leads. Differential fertility is also a topic of concern; the publication of several major reports has raised new problems which require additional study, particularly in relation to social trends in age at marriage and in family size.

Infant Tests

Earlier studies have usually failed to show a significant relation between measures of developmental status in infancy and later mental ability. In the attempt to improve prediction, Escalona (31) used clinical estimates of "optimal level of functioning" in the performance of 72 children on the Cattell Infant Intelligence Scale and the Gesell Developmental Schedules. The assumptions underlying all mental testing imply that defects in cooperation, effort or rapport, or disturbing factors in the environment, will adversely affect reliability and validity. It is not surprising that over short intervals in early childhood, retests showed better agreement of scores when the conditions were favorable to valid measurement. Escalona's results, however, do not promise a technic for effective long-range prediction from infant tests.

From infant tests in the Department of Pediatrics, Yale School of Medicine, Klatskin (60) has noted an apparent tendency for infants currently

tested to make higher scores than were usually obtained 15 or 20 years ago. In a comparison with test norms on the Cattell Infant Intelligence Scale, infants around a year of age showed a significantly higher percent of success on most items, with the constant exception of vocabulary items. The largest percent of passes was on gross motor items. Klatskin suggested that less confining clothes, greater parental attention, and more exercise and stimulation have resulted in general motor advancement. Further evidence is needed, however, to analyze sampling factors.

Abilities at Different Developmental Levels

McKee (66) gave the Primary Mental Abilities tests to a group of superior children approximately five to seven years of age. In all age comparisons there was greater variability among the younger children; this form of the test is probably unsuited for use among seven-year-olds, since superior children approach a ceiling between six and seven. Durling and Benda (26) studied the mental growth curves of Mongoloid patients and found some which reached a peak of development before 16 years, others at later than 20 years.

Two studies of mental defectives have reported on mental scores over a wide age range. Among institutionalized epileptics, Reed (81) found increases in mental ages into the age group 15 to 20. Contrary to reports which have indicated deterioration among epileptics, in these hospital cases no average decline was found between 20 and 45 years. Thompson (94) administered a series of performance tests to mental defectives between the ages of 16 and 69. In comparison with data on normals, decline tends to occur earlier; the significant decline found between age 20 and 30 was attributed to age per se, since it was independent of recency of schooling, degree of motivation, level of attention, or effects of institutional life. Contrary to expectation, performance scores beyond 30 remained approximately constant.

The majority of studies reported in this review utilize results from standardized tests of abilities. In a somewhat different approach, Martin (68) recorded the spontaneous expression of children (age three to seven) when they were given a series of stimuli possessing characteristics of number, size, and pattern. With increasing age the subjects showed greater awareness of size and quantity, and used a larger and more versatile vocabulary to describe their reactions. The ability to discriminate seemed of primary importance, and this ability increased with age. The adoption of a system of terminology, for example, the number system, apparently only facilitated a process already understood on a nonsymbolic level.

Springer (91) studied the development of an understanding of time, and the clock, in four- to six-year-old children who had had no formal instruction in telling time. In outlining the sequence of development with age, she showed that developmental trends are reflected not merely in adequacy and precision of response but also in the nature of the errors.

Feifel (33) analyzed the word definition errors of 900 school children 6 to 14 years of age. A gradual change in the type of error was noted, rather than definite stages. No particular error was made exclusively by any age group. The errors of the older children were similar in type and frequency to those of normal adults.

It is a common belief, not shared by psychologists, that children of low IQ tend to show a compensating superiority in motor activities. Evidence of the fallacy of this belief may be found in the investigations of Sloan (88) with the Oseretsky Tests of Motor Proficiency, and of Cantor and Stacey (15) with the Purdue Pegboard. Crain and Werner (19) studied the development of visuo-motor performance on the marble board, in children from 6 to 12 years old. Figural perception, involving apprehension of part-whole relationships, increased with both CA and MA. As compared with normals, mentally retarded children of the same MA levels were more accurate in final achievement, but displayed less mature modes of visuo-motor procedure and of figural organization.

Another study in a series of investigations of speech development in infants was published by Irwin (51). His evidence indicated that the course of development of initial consonants during infancy is linear; that of medials, decelerating; and that of the finals, accelerating. Initial consonants rarely appeared in speech patterns during the first half-year.

Constancy of IQ, Aptitude and Achievement

The stability of test scores is a topic of enduring interest. For 51 subjects, Brown (12) compared first-grade Stanford-Binet scores with scores on the Army Alpha or the Otis, obtained 12 years later. The mean IQ difference was less than four points. Cane and Heim (14) repeatedly tested small groups of less intelligent and more intelligent adults. They found that test scores tended to increase in all cases, with the initially high scorers showing the greatest improvement. The order of the subjects within their own group was fairly stable, and stability increased toward the end of the experiment. Visually biased questions were easier than verbal or numerical questions for the less intelligent, whereas the more intelligent showed no uniform preference. A differential increase in score upon retesting was also found by Peel (76) among 10- and 11-year-olds, with the greatest increase among subjects whose IQ's were 120-130. In a group of retarded children who had first been tested between the ages of four and one-half and six and one-half, Elwood (29) found no significant change in the mean IQ at later ages (seven and beyond). Similar results were obtained by Engle and Hamlett (30); IQ's based on the Buck Time Appreciation Test showed on the average less than one point change after an interval of three years. Individual cases in which changes of more than 10 points occurred also tended to show changes in the general clinical picture.

Doppelt and Bennett (24) reported on the Differential Aptitude Tests given to the same subjects in Grade IX and Grade XII. In general, abilities were stable over the three-year period. The highest retest correlations were for Verbal Reasoning and Language Usage.

Sex Differences in Intelligence and School Performance

Among 600 college students, Fitt and Rogers (34) found the females to be younger than the males, and superior and less variable on both Form A and Form B of the Cattell Intelligence Tests, Scale III. The sex differences were interpreted as due to the verbal nature of the tests. On a high-grade intelligence test administered by Wallace (101) men's scores were significantly higher than those of women in eight English universities and teachers colleges; at Oxford and Cambridge, presumably due to different sampling factors, sex differences were not significant.

In an institution sample, Johnson (54) tested a group of retarded children on the Raven, Binet, and Arthur tests. Altho the average age of the girls was greater than that of the boys, the boys obtained consistently higher mean scores, with much greater variability. Selective factors operating in referrals to the institution were conceived as influencing these results.

In achievement tests, Grades II to IV, Pauley (75) found girls consistently superior to boys, not only in reading but also in arithmetic, altho the girls averaged two to three months younger than the boys. A study of Negro children in Grade III revealed an even more pronounced sex difference. Pauley urged that the legal school entrance age for boys should be raised at least three months above that for girls.

Differences among Ethnic Groups

Carlson and Henderson (16) have reported IQ differences between a group of 115 American-born children of Mexican parentage and a white, non-Mexican control group living in the same neighborhood and attending the same schools. Children of Mexican parentage consistently tested lower than the controls, the difference between the two groups increasing from the first to last testing, a span of five and one-half years. Mean nonlanguage scores on the California Test of Mental Maturity did not differ markedly from the mean language score for either group. These results are in agreement with some previous studies but are, of course, subject to the usual difficulties of interpretation with regard to the origin of differences between groups which may differ both in genetic selective factors and in cultural background. Pasamanick (74) has commented on the foregoing study, pointing out variables which he considers to have been uncontrolled (cultural-motivational factors, physical factors related to diet, attitudes of examiners, etc.).

Three studies of the performance of white and Negro infants on the

Northwestern Infant Intelligence Test and the Cattell Infant scales have been summarized by Gilliland (38). Negro infants scored significantly higher than whites in one study and higher but not significantly so in two others. The results are in conformity with a number of previous reports in which differences during infancy show a reversal of group differences usually found at later ages. Among Negro children in Grades I to VIII Coppinger and Ammons (18) found a retarded development of vocabulary in comparison with whites: a difference of about two years on the Full Range Vocabulary Test, and of three to five years on the Stanford-Binet vocabulary test. Similar results were obtained for both sexes. On the basis of army tests (AGCT) Fulk and Harrell (35) subdivided over 2000 Negroes and a similar number of whites on the basis of last school grade completed. The mean score of whites exceeded that of Negroes at each grade, but the differences were less at the higher school grades beginning with Grade X. This might be attributed either to greater equivalence of environmental opportunity or to a more intensive selection of Negroes in the upper grades. Performance of both groups was directly related to amount of schooling. Davidson and others (21) used the Wechsler-Bellevue in testing Negro and white psychoneurotic adult patients, matched for age and educational level. The Negro patients scored lower than the whites on the verbal, performance, and full scales, altho on the verbal scale only the arithmetic scores were significantly lower.

Turner and Penfold (97) made a comparison of Indian children of three tribes with white children from surrounding rural districts. Results favored the white children on the Henmon-Nelson and Otis group tests (differences increasing with age) and on the Progressive Matrices Test and the Wechsler Verbal Scale. On the Wechsler Performance Scale, however, the Indian children earned approximately average scores.

It is obvious that the findings reported in this section involve the problem of the comparative appropriateness of different types of test content. Another factor of possible importance is that of bilingualism, which will be discussed in the following section.

Bilingualism

Several recent studies support earlier evidence as to the adverse effect of bilingualism upon obtained IQ. In two elementary schools in New York, Darcy (20) gave both the Verbal Series and the Nonlanguage Series of the Pintner General Ability Test to fifth- and sixth-graders of Puerto Rican parentage who spoke Spanish at home. The mean nonlanguage IQ was significantly higher than the verbal IQ. Two ingenious approaches to the problem of bilingualism have been made by Jones. In one study Jones and Stewart (57) equated a group of 10½- to 11½-year-old bilingual children from rural Welsh-speaking areas with monoglot children from rural English-speaking areas and determined the difference between the two groups on a verbal test after allowance had been made for the

initial difference on a nonverbal test. The difference between the groups was materially reduced but still significantly in favor of the monoglot group. Regression of verbal on nonverbal scores was fundamentally the same in both groups. In another study, Jones (56) gave Welsh-speaking children aged 10 to 12 a nonverbal test with verbal instructions in Welsh, a verbal test constructed in English and two tests of English reading. The mean nonverbal IQ was significantly higher than the verbal IQ, the difference tending to diminish as reading age in English increased.

Environmental Influences on Intelligence and Achievement

The larger part of the studies dealing with environmental influences has been concerned with socio-economic factors in intelligence test performance.

A monograph by Eells and others (27) on the effect of cultural background on test IQ has already stirred a considerable amount of controversy. The monograph includes a review of studies in this area, an analysis of cultural factors which may affect test IQ's, and a report on a field study conducted by Eells. The field study group consisted of children aged 9 to 10 and 13 to 14 from schools in and around Rockford, Illinois. Significant correlations ranging from .20 to .43 were found between test scores and scores on the Index of Status Characteristics. Many item analyses are reported, comparing the responses of two extreme groups, "high status" and "low status" children.

The point of view of the Chicago group concerning cultural factors in test performance is presented in another publication by Davis (22), who points out ways in which the conventional intelligence tests are biased in favor of the upper classes. He gives examples of biased and unbiased items and the difference in percent passing that these items show. It is generally conceded that such psychometric factors are responsible for a part of the socio-economic differences often reported. However, in view of known selective processes in connection with occupational demands and social mobility, some doubt remains as to whether all of the obtained differences between social classes and cultural groups can be explained in terms of test bias.

Current interest in this problem is reflected in a number of other investigations. The socio-economic differential in mental test scores is easily demonstrated as early as two years of age. In infancy, however, reliable tests may indicate either no difference, or higher scores for those of lower status. This has been accounted for both in terms of psychometric factors (early tests less weighted against cultural handicap) and, quite speculatively, in terms of individual differences in growth curves (more rapid earlier growth, especially in functions closely related to phylogenetic traits, among children whose later development has a lower potential). In three different investigations summarized by Gilliland (38) no significant differences in IQ were found when the infants were grouped accord-

ing to mid-parent socio-economic status, or on the basis of educational background of the parents.

Comparing children of upper and lower socio-economic background, Tate (93) found significant differences not merely with the Stanford-Binet but also with two performance scales (Leiter, Arthur).

Thorndike (96) examined a number of community variables as predictors of intelligence and achievement. Measures of the education of the adult population, home ownership, and quality and cost of housing yielded the highest correlations with children's intelligence test scores. Other significant correlations were found between children's IQ's and proportion of native-born whites, rate of female employment, and frequency of professional workers. The importance of these factors differed for rural and urban areas, an urban-rural factor or something associated with it also being important, since the mean IQ's for rural areas were significantly lower than those for urban districts. There was little evidence of relationship between community variables and academic achievement. Thorndike suggested that this might be due to the de-emphasis of traditional subjects in the more advanced communities; the data provided some support for his hypothesis.

Roberts (82) classified a group of Negro college women according to socio-economic status and home location—North or South—and compared their ACE scores and academic achievement over the four-year college period. Differences in ACE scores in favor of the upper socio-economic group were found each year, but were significant only for the southern group. The northern girls were consistently superior to southern girls on the ACE, even when matched for socio-economic status. The relative difference decreased with time, but was still significant at the end of four years. Differences in academic achievement, originally in favor of the North, disappeared by the end of four years. Barrett (4) compared the IQ's of pupils in the two-year and four-year courses in a commercial high school. As might be expected, the students in the two-year course were significantly older and had significantly lower IQ's.

Attitudes toward education, and socio-economic expectation, were examined by Hieronymus (47) among ninth-graders in a midwestern city; low positive correlations were found with both socio-economic status and test IQ. Socio-economic status was more closely related to level of socio-economic expectation than was test intelligence. A study by Phillips (79) involved the correlation of scores on a social questionnaire (based on attitude and behavior characteristics of the various social classes) with scores on the California Personality Test and with IQ on the Otis test. Among ninth- and tenth-graders it was found that pupils with a high score on the lower class social scale tested reliably lower on the Otis and the personality test. Individuals deviating from their allegedly "true" social level scored lower on the personality test and had lower IQ's than "pure" members of a class. Campbell (13) found that underachievers, overachievers, and students progressing as expected, were of about the

same level of intelligence and primary school attainment, but they differed greatly in the social and cultural level of the homes from which they came.

A traditional type of study in the area of nature-nurture is the determination of intelligence and achievement of adopted children. Skodak (87) reported correlations between the IQ's of own-adopted and adopted-adopted pairs of siblings. The mean IQ of the own children was 112; that of the adopted children, 110. The correlation between IQ's of pairs of adopted siblings was .65. The sibling correlation between IQ's of own and adopted children was .21 $\pm$ .13. Skodak pointed out that this is based on a very small number of cases and a restricted range of IQ. She concluded, however, that the patterns of mental growth shown on repeated examinations indicated a similarity between pairs of children growing up in the same family.

A follow-up of children placed by various German agencies between 1913 and 1920 has been made by Zur Nieden (108). These children came predominantly from the lower and middle classes, and two-thirds of them were placed in homes of the same social status as that from which they came. The majority of the others were placed in homes of higher social status than those of their origin. The writer reported that only 8 percent of these children had poor school records.

A review by McCandless (64) covers pertinent literature pertaining to environmental influences on intelligence.

Genetic Influences on Intelligence

Researches on genetic influences on intelligence have been less numerous than those on environmental influences. However, interest in the problem of differential fertility rates among the various intelligence levels in the general population has been given impetus by the publication of two long-awaited surveys. Predictions had been made that the low reproduction rate among persons of superior intelligence and the higher rate of reproduction among those of low intelligence would result in about a one point drop in the average IQ over a period of 10 years. Instead, the Scottish survey (95) showed a higher mean IQ for the 11-year-old population tested in 1947 than had been found among 11-year-olds in 1932. In England, Cattell (17) tested 10-year-olds in a typical industrial area and a typical rural area with a nonverbal intelligence test. The scores obtained in 1949 averaged 1.28 points higher than the scores obtained in these same areas in 1936-37. However, he found that above an IQ of 130, there was a decline at about the rate predicted. Further, when the population was divided into halves, the lower half showed an increase of 2.58 points, while the upper half held approximately constant. Among the factors which might account for the increase, Penrose (78) proposed that fertility may be restricted at the lower as well as the upper end of the intelligence distribution, so that the population is replenished from the middle of the distribution. Lorimer (63) has reviewed recent studies

of differential fertility rates and suggested various hypotheses and conclusions to be drawn from them.

Several recent studies have been made on the relation of intelligence and family size among college students. In such special selections various biasing factors may occur; one of these was demonstrated by Shuey and Hedrick (86), who found a small negative relation between intelligence and family size among 2261 students entering a southern women's college between 1939 and 1949. This appeared to be due, however, to subjects with sisters who had attended the college, and who were admitted under possibly less stringent admission standards than other students. Eliminating these cases, the remaining group represented a section of the population within which differential fertility (with regard to intelligence) has practically ceased to operate. Warburton (102) in England and Maxwell (71) in Scotland also found essentially a zero correlation between students' IQ and family size. In a broader sample studied by Vernon (99) scores on six mental tests were utilized for 10,000 18-year-old British army recruits. The negative r between "g" and family size was greater than that between education and family size.

A subject related to the genetic aspects of intelligence is the frequently reported association between month of birth and intelligence; this is now commonly believed to be due to a socio-economic seasonal difference in conceptions. An interesting study by Gordon and Novak (40) presented three analyses of birth month as related to IQ. Data for entering classes, half-grades, etc., are not fully suitable for this purpose due to academic selective factors; when these factors were controlled by taking records for an entire school, the mean IQ for children born in October was found to be significantly higher than for children born in April. This is not in agreement with some previous studies.

Kallmann (58) has summarized and interpreted the present state of knowledge of the genetic aspects of mental deficiency. An analysis of available data on familial Mongolism in relation to maternal age was made by Penrose (77). He suggested a genetic factor, the manifestation of which might depend largely on conditions connected with maternal age. A report taking an opposed point of view was that of Benda (8), who cited three recent monographs all of which emphasize health deficiencies in the mother, rather than genetic factors.

General Treatments of Defective and Gifted Children

Recent literature has been reviewed by Whitney (104), Fairweather (32), and also, in relation to definition and differential diagnosis, by Robinson and Pasewark (83). Other papers dealing with the mental defective were those of Benda, Farrell, and Chipman (9), Doll (23), Guertin (41), and Whitney (105). Jastak (52, 53) and Kanner (59) have been particularly concerned with the role of emotional disturbances in relation to apparent mental retardation; the latter outlined the results of a factor

analysis of personality variables and their relation to learning. The major adjustment problems of mentally retarded children, at different age levels, and problems of training, have been discussed by Hay (43). Adjustment problems have also been described by Walker (100), and Weiner (103) with reference to retarded children in school, homes, and in institutions.

The gifted child has commanded somewhat less attention in the literature. Two principal reports are by Witty (2, 106), who pointed out the need for early identification and guidance of superior children and stressed the importance of the home in fostering talent and in social and emotional growth.

Mental, Physical, and Physiological Interrelationships

As has been true in the past, many of the attempts to assess relationships between mental and physical development have utilized the mentally defective as subjects.

Glasser, Jacobs, and Schain (39) determined the Rh types of 200 mental defectives and their mothers. The percent of Rh-positive children of Rh-negative mothers was not significantly different from that in the general population. This finding is particularly important in view of the claims which have been made regarding the role of Rh incompatibility in producing mental deficiency.

Using normal siblings as controls, Gerver and Day (37) studied the mental abilities of children who had recovered from erythroblastosis. The affected children had significantly lower IQ's than their unaffected siblings. There were low positive correlations between IQ and total amount of blood administered and between IQ and lowest recorded level of hemoglobin. In order to evaluate inferences which have been made concerning the effects of anoxia upon mental development, Usdin and Weil (98) compared children who had been apneic for three or more minutes at birth with a control group who had breathed spontaneously. There was no significant difference in IQ between the two groups.

Boldt (11) studied the records of institutional patients in search of potential cases of postnatal cerebral trauma. He estimated that 1.5 percent of institutional defectives had suffered such trauma. Spinal X-rays of Mongols by Mautner (69) revealed a high incidence of spinal defects. He concluded that his findings agreed with other data supporting a theory that pathologies appearing in Mongols are related to development taking place during the sixth to ninth week of fetal life. In another study Mautner (70) investigated congenital heart disease among the feebleminded. Igersheimer and Mautner (50) found a type of cataractous opacity developing in the lens of Mongols, chiefly between the ages of 12 and 14. This lens change was similar to changes found in certain endocrine disorders. A study of dentition in mental defectives by Spitzer and Mann (90), indicated that anomalies of the teeth are related to various congenital defects. In Mongols, Dow (25) found an early incidence of the tooth anomaly

known as periodontoclasia and suggested tissue starvation due to a slight anoxia as a possible cause.

The role of hearing defects in mental deficiency has often been discussed. Birch and Matthews (10) tested the hearing of patients in a school for defectives. In comparison with data available for normal groups there was two and one-half to 18 times as much hearing loss among the retarded, depending on the tonal frequency used. The median hearing loss for males was about three times that in the general population; for females it was approximately 10 times that of the normal population. Schunhoff and MacPherson (85) surveyed 60 institutions for the mentally deficient and found a high percent of hearing impairment. They recommended the establishment of classes for the hard-of-hearing in state schools rather than the inclusion of defectives in schools for the deaf.

An operation designed to increase the blood flow to the brain was reported by Beck, McKhann, and Belnap (6) as producing intellectual improvement in children suffering from brain abnormalities due to injury or inflammation. The most striking results were obtained in cases of convulsive disorders.

Blind children at Perkins Institute were tested by Hayes (44) with adaptations of the Binet and Wechsler tests. In comparison with the Stanford-Binet standardization group, there were more blind children at both extremes; on the Wechsler, the weighting was heavier at the upper end of the distribution. Nonequivalence of tests, sampling factors, and effects of special training may have influenced these results.

In a study by Smith (89), deaf children 11 to 16 years of age scored significantly below the standardization means on the Progressive Matrices Test, the Jenkins Scale of Non-Verbal Intelligence, and on reading and arithmetic tests. There was no relation between percent of hearing loss and IQ or between IQ and age of onset of deafness. Younger deaf children, between 4 and 11 years, were not significantly below the population mean, but there was a suggestion of declining score with increasing age.

Bayley (5) investigated the relationship between intelligence and masculine interests (Kuder tests) and masculine physique (somatic physique) among subjects from the Berkeley Guidance and Growth Studies. Generally negative results were obtained. On the hypothesis that critical flicker-fusion is a centrally limited phenomenon, Tanner (92) correlated several measures of critical flicker-fusion with scores of male college students on the ACE. In this preliminary study several significant correlations were obtained.

Hofstaetter (48) presented a theoretical paper relating rate of maturation, among animal species, to the ratio between brain weight and body weight.

Recent studies of the effects of glutamic acid reflect greater care in experimental design and in the use of controls. In well-controlled experiments, Ellson, Fuller, and Urmston (28), Loeb and Tuddenham (62), McCulloch (65), Milliken and Standen (72), and Oldfelt (73) all agreed

in finding no significant improvement on tests of intelligence, personality, or motor ability after the administration of glutamic acid. Harney (42) claimed beneficial effects of glutamic acid on the mental age, personality, and school achievement of retarded girls. No effect on physical growth was observed.

With some conflict in results, two studies reported follow-up investigations on cases which had shown earlier improvement during glutamic acid therapy. Quinn and Durling (80) found that a substantial proportion of their cases retained IQ gains but made no noticeable improvement in social competence. Rudolf (84) stated that about half of his cases continued to improve but in one aspect only. Gains in IQ were slight but improvements in social age and social quotient were regarded as more noticeable. A review by Gadson (36) provides a summary of the work on glutamic acid and mental deficiency.

Intelligence and Personal and Social Adjustment

Lightfoot (61) compared 10- to 13-year-old children classified into two groups, the bright (IQ 130-200) and the dull (IQ 68-104), on a large number of personality variables. The bright children were favored on ratings of achievement, affiliation, autonomy, cognizance, creativity, and dominance; the dull children were favored on ratings of dependence. In comparison to the norms for the Maller Personality Sketches, the bright were somewhat better adjusted than average; the dull, less well-adjusted. There were significant differences between the two groups on 22 of the "Forty Attributes of Personality."

In a study of the fantasy life of mentally defective girls, Beier, Gorlow, and Stacey (7) found that the richness of their TAT protocols compared well with those of normal adolescents. Traditional signs of concreteness and perseveration were noted. The girls tended to produce rich and sensitive stories with weak, superficial outcomes. Projections seemed to be less distorted than those of normals, as if social learning had not provided the defective with technics for dissembling. Albee and Pascal (1) observed competitive behavior in mentally defective boys. The dominance order was significantly correlated with MA, as was popularity of individuals. In general, brighter members of the group tended to seek each other's company and were looked to as models. There was no significant relationship between dominance and popularity or between dominance and physical strength, height, weight, or CA. Contrary to expectations based on normal boys, physical strength had little relationship to either dominance or popularity. Among mentally deficient girls, Hays (45) also found that there was a hierarchy of acceptance, showing a fairly high relationship to mental level. The choice of friends was more closely related to MA than to IQ or CA. However, there were suggestions that acceptance was also based upon race, clinical type, and length of residence in the institution. Hollinshead (49) found no difference in social maturity, as

measured by the Vineland Scale, among retarded adolescents who were classified as only child, youngest, oldest, or middle child.

Mangus (67) studied retarded children who were in a Grade III to VI population of over 1200 cases. The majority were dull, normal and borderline; 43 percent had IQ's of 90 or above, and 3 to 4 percent were below 70. Teachers' ratings of these children indicated a tendency toward personality problems, and personality tests similarly showed indications of poor social and emotional adjustment. A study of the social position of retarded children in schools which had no special classes revealed, according to Johnson (55), that their mean social quotient was significantly lower than that of the other children. Acceptance scores increased steadily with IQ, while rejection scores decreased. The percent of "stars" increased with IQ; the percent of isolation decreased. Retarded children were seldom rejected because of poor academic ability. Instead, the reason given most often for their rejection was unacceptable behavior. A comparison which controlled the factors of socio-economic status, and of being overage for grade, indicated that social position in the school was less influenced by these factors than by intelligence.

Ausubel (3) investigated prestige motivation among gifted children in Grade VI. Children with IQ's of 130 or more were divided into two groups, the highest prestige children and the lowest prestige children. The difference between scores made under anonymous unspeeded conditions and under conditions emphasizing competitive status and prestige was significantly greater for the high prestige group. It was also found that high prestige children more often expressed enjoyment of the competitive situation, and worked faster under prestige motivation conditions. Differences which were suggestive but not significant included greater liking for arithmetic by the high prestige group and more frequent self-imposition of competition during anonymous tests by the high prestige group. The upper group was rated higher on scholastic competitiveness by themselves, their parents and their teachers.

Many of the studies reported above involve only minor contributions. Altho of cumulative value, they lack the scope and impact of major research. It is to be hoped that future investigators will be able to make more systematic use of statistical technics which are now available but which are often ignored or used poorly—factor analysis, where this is appropriate, and analysis of variance, both for separating the influences of different variables and for assessing interactions between variables. We may also hope that more extended use will be made of longitudinal studies, particularly of twins and of children from contrasting environments.

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CHAPTER III

Aging and Psychological Adjustment

NATHAN W. SHOCK

THE term "psychological adjustment" refers to the processes by which an individual seeks to secure satisfaction of his wants and needs. The processes available to the individual as well as the methods followed undoubtedly change with age, since desires, needs, and goals are different at different ages. In addition, changes in structure and functional capacities of the individual which take place with advancing age may limit the methods available to him in securing satisfactions for these changing goals. On the other hand, life experiences may offer a widening range of adjustment technics to the individual. Of equal importance are the restrictions and limitations imposed by the cultural pattern in which the person lives. In our own society, the adjustment of older persons is rendered particularly difficult because we have not yet developed any universally sanctioned pattern of activities for the transition from middle age to old age. In primitive societies, the role of the "elder" was specifically defined (76).

In the United States the aged, in spite of a few conspicuous exceptions, are no longer held in the position of respect characteristically occupied by the aged in past society. Furthermore, our society, while setting up specific requirements for retirement, has not yet defined any specific functions for individuals after retirement.

Altho a strictly scientific approach to the problem of adjustment would simply describe the behavior patterns followed by individuals in securing satisfaction for their wants and needs, most research has been centered about describing differences between "good" and "poor" adjustment. Thus a value judgment has been introduced by most investigators. In general, the "well-adjusted" person is said to be "the person who is able to satisfy his needs quickly and adequately within the controls and outlets provided by his culture" (17). It should be emphasized that any attempt to rank individuals with respect to adjustment on the basis of this definition involves a multi-dimensional problem: estimates of relative degrees of satisfaction of individuals, speed of attaining these satisfactions, and estimates of the acceptances of the methods used within the framework of the social structure must all be made. When we add the component of change in social patterns with time, the problem of measurement becomes vexing, to say the least.

This review will concern itself with (a) the role of individual orientation with respect to needs and goals, (b) the role of age changes in the individual which may limit or extend the processes available for attaining desired goals, and (c) the role of limitations imposed on individuals by the social and cultural environment. Only illustrative studies can be men-

tioned in the space available. In the past, most studies have been directed toward the second question. Very little research is available on the third question.

The Role of Individual Orientation

Age Changes in Needs and Goals

Even casual observation leads to the presumption that needs and goals change with age. Studies in the field of child development have shown how the incipient cowboy of five becomes the potential engineer at 15 and finally ends up as the bond salesman at 35. However, little is known of what changes in goals the bond salesman may undergo as he becomes 60 or 70 years of age. Clinical studies by psychologists and psychiatrists have indicated the futility of attempting to obtain information on the true motivation and goals of individuals by direct questionnaires or interviews. Much more subtle devices must be utilized. It is to this end that many of the so-called "projective" technics have been developed. Altho the aims of these technics are most worthy, it must be admitted that up to the present most of them lack the kind of specificity and degree of standardization that psychologists have come to demand in problems of measurement.

Some of these methods, such as the Rorschach, have been applied to older subjects. For example, Klopfer (48) administered individual Rorschach tests to 50 subjects between the ages of 62 and 93 years. The author interpreted his results more in terms of a subject's response to the environment than in terms of changes in fundamental goals or needs. He believed the test results indicated "loosening of intellectual ties to reality, inability to make full use of inner resources, difficulty in forming social relationships, and reduction in responsiveness to fine emotional nuances in the environment" among the aged subjects. The vagueness of these statements emphasizes the need for a sharpening of concepts and methodology in the field of projective tests if they are to prove of value in establishing specific age differences (87).

A more direct approach to the question of age changes in goals has been made by Kuhlen and Johnson (50). Responses to the question "What would you most like to be doing 10 years from now?" were secured from a 39 percent return of high-school and elementary-school teachers between the ages of 20 and 64 years. The responses were analyzed separately for 467 single women, 280 married women, and 218 married men. In all groups, interest in retirement within the next 10 years began to occur in the forties. This response may reflect an acceptance of the cultural requirement to retire at age 60 or 65 rather than the desires of the individual. Hope to marry, expressed by the majority of single women in their twenties, was mentioned by very few after age 30, at which age the

desire for vocational advancement was stated with increasing frequency. Young married women teachers in their twenties indicated a desire to be in their own homes, and vocational goals were more secondary than in the case of the single women. Married men were primarily interested in vocational advancement. After age 40, those desiring to change their vocation diminished rapidly to 0 percent at age 55.

Age Changes in Interests

The expressed interests of individuals may be of value in the assessment of their goals. An extensive body of information regarding interests has been derived from studies utilizing the Strong Vocational Interest Inventory (82). Altho originally devised to differentiate between interests of people successful in different occupations, investigations over the years have yielded data pertinent to age. Comparison of interests of 472 15-year-olds, 215 25-year-olds, 275 35-year-olds, 213 45-year-olds, and 151 55-year-olds led to the observation that the 400 items of the inventory could be classified into four major categories: (a) items showing consistent age differences in all occupational groups from age 15 to 55, (b) items exhibiting age differences common to all occupational groups but with an alteration in the direction of change at age 25, (c) items whose age trend varied between occupational groups, and (d) items which changed very little with age in any group (84). Examination of the items showing definite age differences reveals certain natural clusters, but the reasons for the differences are difficult to identify. The decrease with age for liking "aviator," "secret service man," and "ship's officer" may be regarded as specific instances of growing dislike for hazardous occupation. There was also a trend in increasing like for more sedentary activities among the older group. In general, Strong has found that vocational interest scores change greatly between the ages of 15 and 25 but that between the ages of 25 and 45 the general population earns for each of the 34 scorable occupations almost uniform average scores from decade to decade. However, some occupational groups, such as aviators, showed lower scores on scales for their own occupation in successive decades.

Strong (83) has also retested several groups of men after intervals of 1 to 22 years. In a group of 228 men who were first tested as Stanford University seniors in 1927 (mean age 22), the median intercorrelation between scores made at this time and retest scores obtained 22 years later was 0.75. This indicates a rather remarkable reliability of scores designed to indicate interests over a period of two decades.

Age Differences in Masculinity and Femininity of Interests

With increasing age the differences between interests of males and females diminish. Terman and Miles (86) devised a questionnaire consisting of items which in preliminary studies indicated different distri-

bution of responses by men and women. Responses were obtained from 1047 men and 1912 women between the ages of 20 and 89 years. A decline in masculinity of interests or increase in femininity of interests for both men and women after the age of 20 was found. The decline in masculinity of interest scores was much greater for men than femininity was for women. The decrease in masculinity of interests of men was greater than the reduction in femininity of interests of females at the high age levels. These results indicate that the activities, opinions, likes, and dislikes which distinguish men and women are to a large extent the same as those which distinguish younger men from older men. For example, women are less inclined to participate in sports than are men, and older men are less inclined to engage in these activities than are younger men. Rather than describing older men as more feminine than younger, it is equally correct to describe women of all ages as more mature than men, since their interests resemble those of older men more closely than they resemble those of younger men.

Scores for masculinity and femininity of interests may also be derived from the Strong Vocational Interest Inventory. Such scores show a tendency toward an increase in femininity of scores with advancing age, altho the trend is less pronounced than in the data reported by Terman and Miles. Altho the differences in results may be due to differences in the sampling of subjects, it is equally likely that they are due to differences in the selection of test items. Strong selected items which differentiated between occupational groups, whereas Terman and Miles selected items which differentiated between males and females. This emphasizes the need to select test items which are representative as well as to select representative subjects.

Age Changes in Reading Interests

Unfortunately the numerous studies of the amount and kind of reading done by various groups (42) do not lend themselves to an identification of age differences since the selection of subjects has not been broad enough to justify generalizations. A summary of public opinion polls (16) gives some information about specific types of reading matter such as newspapers. The studies summarized were conducted in Belgium and Sweden and indicated a slight increase in reading of newspapers among elderly people. More pertinent is the study of Campbell and Metzner (15), who conducted a survey of library usage in a national sample of libraries in the United States. One of the questions analyzed for age differences concerned the number of books read during the preceding year. The percent of individuals reading 10 or more books per year was greatest among the 21-to-29-year-olds and fell off sharply with advancing age. It is doubtful whether this finding represents a change in reading habits, since the persons over 60 years of age must have had less exposure to formal education and less access to library facilities in their youth

and middle age. The fact remains, however, that elderly people at the present time do not utilize their time in reading. This fact is recognized by many librarians, and positive steps to expand adult education to include the older age groups have been proposed (25).

Age Changes in Attitudes

Attitude Scales. Since it has been over 20 years since Thurstone first introduced the concept and methodology for the quantitative scaling of attitude items, one might expect the accumulation of an appreciable body of information on age differences in specific attitudes. Unfortunately, this is not the case. By far the greater number of studies still depend on the interpretation of data obtained from unscaled questionnaires or from interviews. Studies utilizing attitude scales are illustrated by Lorge (55) and Marple (56). Lorge compared scores obtained two weeks apart on a number of Thurstone's attitude scales and found higher correlations between the two sets of scores in subjects over 40 years of age than in subjects 20 to 25 years of age. The investigator concluded that there was greater stability of social attitudes in the older subjects than in the younger. The results also support the theory that a generalized attitude matrix has been adopted by the older subjects as a frame of reference for social attitude judgments. Altho the average scores obtained by the older subjects tend generally in the direction of greater conservatism, the standard deviations are so large that the differences lack statistical significance. No analysis of the age differences in mean scores was made.

Resistance to Change. Marple (56) attempted to alter the expressed opinions of three different age groups by informing the subjects of majority opinion and also of expert opinion on the same topics prior to a second testing. Altho there was a greater shift in expressed opinion (in the direction of greater agreement with majority opinion) among the high-school pupils than among college students and adults (mean age 39.1 years), one cannot assert that the adults were more resistant to change because of their age since the high-school pupils may live in a social climate which fosters the uncritical acceptance of statements of authority.

Conservatism. A comparison of the attitudes and values of two generations (college students and their parents) was made by Fisher (31) using data from standard questionnaires. She concluded that in the parents, conservative and orthodox attitudes were stronger than the more radical and critical ones, whereas the reverse was true among the college students.

A number of investigators using various questionnaire and interview technics have attempted to demonstrate a correlation between age and conservative attitudes without success (73).

Pollak (65) analyzed the responses to questions asked in market research programs using population samples which varied in size from 200 to 4600 subjects. The questions dealt with acceptance or rejection of new commercial products, innovations in packaging, and changes in economic,

social, or political organization as well as governmental policies. In none of the material could a clear dichotomy between conservatism of the old and progressivism of the young be demonstrated. Where there was a conservative majority among the old, there was a conservative majority among the young.

Cantril and Strunk (16) have assembled the results of national polls taken in many countries between 1935 and 1946. In some of the surveys reported, responses have been tabulated according to age groups (usually into groups 20 to 29, 30 to 49 and 50 years and over). Among the many questions asked, it is possible to isolate a number in which the proportion of "yes" responses diminishes with increasing age. Examination of these items might lead to the conclusion that old subjects are more conservative than young. This conclusion is not warranted, since among a large number of test items, significant differences in responses of any two groups will occur by chance. Furthermore, many of the questions in which age differences in response occur cannot be unequivocally classified as conservative or liberal.

Thus objective evidence of greater conservatism among older subjects is not available. The need for carefully designed and controlled studies in this important field is evident. Of even greater social importance is the need to examine critically the effectiveness of various technics for altering the attitudes of both young and old.

Age Changes in Estimates of Happiness and Sources of Anxiety

Some indication of the spread between goals and aspirations and their realization may be gained from ratings of happiness and feelings of anxiety or worry. Unfortunately, most of the information on happiness is based on retrospective reports. For example, Kuhlen (49) asked each subject in an interview to draw on a chart a line representing his level of happiness at various ages in his life. In a group of 300 adults ranging in age from 20 to 80 years, happiness ratings tended to increase in the twenties and thirties and to decrease thereafter. Major causes for happiness were related to romance, marriage, family, and occupation. Bereavement, poor health, and occupational difficulties were major sources of unhappiness. The pitfalls in interpreting subjective responses based on retrospective reports are obvious.

Tuckman and Lorge (91) asked 128 graduate students (age 21 to 51, mean 31.2 $\pm$ 7.1 years) enrolled in a course on the psychology of the adult to place in rank order the ages in life at which they believed people were most happy. Eight age periods ranging from "up to 12 years" to "70 years and over" were arranged in rank order with respect to a total of 21 traits such as happiness, freedom from worry, health, living a full life, job satisfaction, and ability to learn. Early childhood was considered the most favorable period for "happiness" and "freedom from worry";

adolescence was considered the peak period for "taking part in active sports," and "ability to learn"; the twenties were ranked highest for "health," "ambition," "friends," "freedom," and "in the seeing of things"; the thirties were ranked highest for "activity in family affairs," "needed by others," "meaningfulness of life," and "living a full life"; the forties for "job satisfaction," "salary," "interest in politics," "clubs and organizations," and "financial security"; the fifties for "authority and prestige"; the sixties for "hobbies"; and the seventies and over for "religion."

The attitudes expressed by these subjects may reflect the cultural stereotype that aging is always accompanied by physical and mental decline. There is great need for a continuing educational program to change the negative attitudes toward aging and to develop concepts of a productive, happy, and meaningful later maturity and old age.

It is important to note that only 3 percent of the aged people interviewed by Gardner (38) reported present unhappiness. Altho happiness is undoubtedly a characteristic of psychological importance, it is a multidimensional quality that requires a more precise definition than can be obtained in a gross over-all rating approach. Estimates of happiness should be made in terms of the present situation by young and old for useful comparison.

Age changes in the source of anxiety and worry have been reported by Kerr, Newman, and Sadewic (47). A questionnaire listing 12 potential fields of worry was mailed to 250 American psychologists born prior to 1903. Responses were received from 103 between the ages of 46 and 81 years. Personal appearance and sexual morality were reported as major sources of worry in the twenties by approximately 50 percent of the respondents, whereas 91 percent of the group reported economic and financial worry most prevalent in their early thirties. In the forties the abandonment of hopes or ambition and marital difficulties were the most frequent sources of anxiety. Thus, among this special, but definable population, there is some evidence that the sources of anxiety shift with age. In older subjects, the problem of health and income maintenance become important sources of anxiety (18).

Lifetime worry patterns are also influenced by socio-economic status. Dykman, Heimann, and Kerr (26) compared the worry patterns of 101 successful business men and 100 denizens of Chicago's "Skid Row" with results previously reported on 100 psychologists (47). Ages ranged from 43 to 91 years in the business men and from 44 to 77 in the casualty group ("Skid Row"). The data were obtained by direct-contact anonymous ballot interviews. Contrary to expectations, the casualty group showed a concentration of worries over economic problems in their thirties which extended over a greater age span than did similar worries reported by the business men. Whereas both psychologists and "Skid Row" cases reported a greater incidence of worries than did businessmen, psychologists tended to resolve their worries in a shorter span of years than did the other groups.

Adjustment Inventories

The most widely used device for evaluating attitudes and activities of older people is the inventory, "Your Attitudes and Activities," prepared by Burgess, Cavan, and Havighurst (14). This inventory consists of a series of 110 statements, some of which are checked, some of which are answered by "yes" or "no," while others have a four to seven point intensity distribution. The items are arranged in categories covering health, family, friends, leisure and recreation, clubs and organizations, employment history, financial security, early life, and attitudes. Arbitrary scores are assigned each response on the basis of comparisons of responses of other groups of older individuals judged by interviewers to be well adjusted or poorly adjusted. The correlations between ratings of adjustment made by two to five judges and scores on the schedule range from 0.53 to 0.78. Thus, the schedule is more than a device for the description of attitudes and activities—it attempts to classify individuals on the basis of a value judgment made by the investigators.

Cavan and others (18) have analyzed in detail the responses of 499 men and 759 women (aged 60 to 99 years) to items in the inventory, "Your Attitudes and Activities." Responses were obtained thru staff interviews, interviews by sociology students from a number of colleges, and by mailing schedules to the older alumni of one college and one university. The sample of subjects was drawn from the entire United States but differed from the general characteristics of the population, over 60 years of age, in that the study group contained: (a) fewer persons in the sixties and more in the seventies and early eighties, (b) fewer foreign born, (c) fewer farm residents, (d) fewer subjects residing in small villages, (e) subjects with three to five years more formal education, and (f) more representatives of business and the professions than the general population. In this group, the median score on the attitude inventory declined progressively with age. Calculation of scores on subgroups of items on the schedule indicated that increased age is associated with the following: (a) a decrease in the number of close companions; (b) a decrease in social participation; (c) increased feeling of economic security in spite of lowered amount of income; (d) increase in physical handicaps, illness, and nervousness and a decrease in feeling of satisfaction with health; (e) increase in religious activities and dependence on religion; and (f) decrease in feelings of happiness, usefulness, zest, and decrease in general interest in life. Women reported more physical handicaps, more illness, and more dissatisfaction with their health than did men in spite of the statistical fact that, on the average, women live two years longer than men. Women reported more religious activity and more favorable attitudes toward religion than men but were less happy than men.

Granick (40) has compared the adjustment of older people from two samples of retired people living in two different communities in Florida. Altho one community was of definitely higher economic status than the

other, the similarities in psychological problems were far greater than the differences. Altho the one group lived more comfortably and had more money to spend, their health, family status, attitudes, and ways of spending their time did not differ significantly. At lower levels of income, significant differences in adjustment appeared. Thus, Shanas (71) found poorer adjustment scores among recipients of old age assistance in Chicago than among other population groups such as YMCA secretaries (12) or school teachers whose adjustment was rated by the same instrument (18).

Interviews and questionnaires indicate that the activities of elderly adults are primarily sedentary such as visiting, reading, listening to the radio. Fried (36) found that inactivity in elderly people was much more frequent among low income groups than among those with moderate or high income. The elderly people interviewed complained of inactivity and indicated their preference for doing something. The desire for continued activity has important social implications and indicates the need for re-education both of individuals and the community with respect to attitudes toward aged people. It is also apparent that our educational system has failed to develop in individuals inner resources for continued expansions of interests and activities thruout life. This represents a major challenge to our educational system today.

The Role of Performance Capacities and Abilities

Age Changes in Perception

The maintenance of satisfactory adjustment to the social environment is obviously dependent on perception and communication. The sense organs of vision and hearing represent an essential link in the chain of events leading to communication. Hence, data on age differences in perception are of considerable importance.

Age Changes in Hearing. Altho the incidence in deafness increases with age (from 1 percent at age 20 to 5.9 percent at age 65) (3, 79, 95, 99), the pattern of hearing impairment present in adults is of greater importance. For pure tones of frequencies up to and including 512 cycles per second the total impairment with aging is slight (13, 20). In contrast, there is a marked loss in the perception of tones of frequencies 1760, 3520, and 7040 cycles per second with increasing age. Two independent studies, one on a large sample of subjects tested at the World's Fair in Chicago (79), and the other on 3700 subjects tested at the San Diego County Fair (95), are in essential agreement. Whereas less than 1 percent of the 10-to-19-year-old group showed a hearing loss greater than 45 decibels for a tone of 3520 cycles per second (the higher components of speech), 45.0 percent of the males and 13.6 percent of the females aged 60 and above showed a loss of this degree (95). The greater incidence of hearing loss in males than in females was observed at all age levels. The impairment in perception of higher tones in people over 50 is of psychological

significance since the perception of higher frequencies plays an important role in the understanding of conversation, particularly when several people are speaking at the same time. The ability to understand speech cannot be determined from the audiogram alone. Both the Psycho-Acoustic Laboratories at Harvard University and the Bell Telephone Laboratories have developed standardized speech comprehension tests (22). Altho it is now possible to measure the hearing loss for speech in two syllable words, these tests have not been applied on an age-wide basis. For an appraisal of the understanding of speech, the percentage of carefully selected words which the subject understands as they are spoken in increasing intensity has also been utilized (23) but no data are available in terms of age. In everyday life it is usually necessary to distinguish particular sounds in a background of noise of variable intensity. Hence, tests of masking and discrimination should be applied to older persons in assessing the social adequacy of their hearing.

The degree to which hearing defects may be compensated by adequate hearing aids has an important bearing on the psychological adjustment of older people. According to Silverman and Taylor (75), the value of hearing aids for the aged is questionable. This conclusion is based on the presumption that much of the loss in perception of high frequencies is the result of structural changes in the ear and the auditory nerve and that older persons have less patience and learn less readily than younger ones. While it is true that marked high tone hearing loss is characterized by structural changes, attempts to relate moderate degrees of hearing loss with structural changes have not been successful (75). Hence, it appears that the major obstacles in the correction of hearing impairments are psychological in nature, that is, adequate motivation and training in the use of the device.

Age Changes in Vision. The requirements of daily living depend not only on visual acuity but also on the speed of perception and the comprehension of complex patterns. There is universal agreement that visual acuity diminishes with age (19, 21, 70). Part of this diminution, which becomes more marked after age 40 (19), may be attributed to structural changes in the eye such as increased rigidity of the lens, degenerative changes in the retina (37), and in part to a gradual reduction in pupillary size (9). Bernstein (5) found that the change in refraction of the human eye with age followed a logarithmic function. Furthermore, beyond the age of 20, the sensitivity of the eye under conditions of reduced illumination diminished progressively ($r = .50$) even when pupil size was held constant (7, 29, 67).

The question of age changes in color vision is an open one. Tiffin (89) and later Tiffin and Kuhn (90) concluded that after age 45 both sexes show a loss in color vision, but their evidence is not convincing. Other studies have failed to find evidence of deterioration in color discrimination between the ages of 20 and 60 (11, 19, 78), altho Smith (78) observed a definite drop in ability to discriminate colors beyond the age of 60.

The apparent discontinuity in age changes in color discrimination should be investigated by repeated measurements on the same subjects as they progress from age 55 to at least 65.

A reduction in the speed of visual perception has been demonstrated in individuals between the ages of 20 and 45. Weston (97, 98) retested the same group of experienced observers after a five-year interval and found a significant decrement in all cases. The task consisted in the identification of the gap in a series of Landolt rings. The decrement was greater in the older subjects than the younger and was more apparent at lower levels of illumination (0.5 lumens per square foot) than at higher (500 lumens per square foot). Other complex visual tasks, such as the perception of incomplete pictures, require more time in older subjects (35 to 36 years) than in college students (94). Somewhat related to speed factors in vision is the critical flicker fusion frequency, which fell from an average of 44 to 32 cycles per second in males between the age of 12 to 16 and 77 to 80 years. The correlation of critical flicker-fusion with age was −0.52 (60). Interpretation of these results is difficult partly because we do not know how much of the fusion process (whereby an intermittent light stimulus is perceived as a steady light) is peripheral and how much is central and partly because of technical problems in methodology and experimental design. The results may be taken as evidence of slowing of perceptual processes in the aged.

It is obvious that many of the perceptual deficiencies of the aged may be minimized by the use of proper lenses. Unlike hearing aids, the wearing of glasses has come to be accepted as part of our cultural pattern. Altho the impairments of vision related to speed of response cannot be minimized by these devices, the observation that older people benefit markedly from increased levels of illumination (29, 98) offers a potential solution. It is also possible that special training could do much for older persons. No specific experiments on the effects of training in older subjects have been reported, altho it is an approach that should be investigated.

Age Changes in Strength and Motor Skills

Quantitative measurements of the strength of various muscle groups have shown a maximum at age 25 to 30 years followed by a gradual decrement up to age 60, followed by a more rapid drop to age 80 (1, 30, 70). It is also clear that the ability to do fatiguing muscular work diminishes with age (77). Since in our present cultural pattern there are few instances where sheer muscular strength is an important factor in performance, this decrement in capacity is of little significance in the adjustment of older people. Of greater significance is the gradual impairment of fine motor coordination (96) and the gradual slowing of the speed of motor responses which begins at 30 to 35 years of age and continues thruout the life span (57, 58, 59). The speed of simple and choice reaction time to both sound and light stimuli diminishes signifi-

cantly with age (4, 32, 39). The speed of well-practiced motor responses, such as handwriting, also diminishes with increasing age (8). The physiological or psychological basis for the gradual diminution in speed of response has not been determined, altho Welford and his associates (96) have developed the concept that changes in skill with age result from changes in the central receptive or perceptual processes rather than from central motor processes or peripheral elements. This hypothesis, altho attractive, requires further experimentation since it has been shown that the speed of conduction of the nerve impulse diminishes significantly after the age of 40 (62). However, the reduction in speed of conduction is not great enough to account for the lengthening of reaction time and diminished speed of other motor responses that are well established. Unfortunately, it has not been possible to design an experiment which will estimate speed of transmission across a nerve synapse in the human.

The reduced speed of response that is apparent in most elderly people has important implications for behavior in a society that places major emphasis on speed and vigor. However, the observed reduction in strength or speed with advancing age should not be regarded as inevitable. The need for research on the possibility of retaining psychomotor proficiency thru special practice or by other means is clearly indicated. In addition, research is needed to determine whether modifications and improvement in the design of equipment and changes in working conditions could not compensate for minor losses in psychomotor abilities.

Age Changes in Disease Incidence

The presence or absence of disabling chronic disease has an influence on behavior and psychological adjustment. A great deal has been written about the increase in physical disabilities in old age. Space does not permit inclusion of this literature, which has been summarized by Stieglitz (80) and Monroe (61). The preoccupation of medical literature with the increased incidence of heart disease, cancer, arthritis, and mental disease must not blind us to certain facts. First of all, most of the information about the incidence of disease and disability is based on the National Health Survey conducted by the United States Public Health Service in 1935-36 (63, 92). In this survey 739,893 families (2,642,809 persons) in 83 cities and 23 rural areas of 19 states were interviewed and tested. On the basis of this study it was estimated that some 23 million persons in the United States were handicapped to some extent by disease, or accidents, and that the incidence of disability increased markedly among the older age groups. It must be remembered that evidence of disability was based on the verbal report of one member of a household and not on physical diagnosis. Furthermore, most of those reporting disabilities were able to work and were living in the community. In fact, more recent studies of older people have indicated that altho 60 percent of those aged 75 to 84 years reported some impairment, less than 10 percent are actually

disabled (74). Sheldon (72) found that approximately two thirds of women over 60 and men over 65 were physically "normal." Among older people living on old age assistance, only 2.5 percent were confined to bed, 8.5 percent were confined to their houses, and 22.5 percent were capable of limited movement in their district. All studies of disease incidence suffer from grave sampling problems. However, it is clear that the reaction of an individual to his disability is the problem of major importance. Many individuals, some suffering from major complaints, learn to "live with their disease" and continue to lead useful and productive lives, while others succumb to even lesser degrees of disability and become chronic invalids (81). The important problem for research is to identify the factors responsible for these differences in response. The studies of Ruesch and his associates (69) have made a beginning. Their results indicate the importance of the social environment in the determination of chronic invalidism.

The increasing admissions to mental hospitals among older people (44, 51) are often cited as evidence of final breakdown of psychological adjustment. It must be remembered that admission to a mental hospital depends not only on the existence of mental disease, but also upon the attitude of the patient and the patient's family and community toward institutionalization and upon the ability of the family to care for the patient in the home. With the trend toward urbanization, opportunities for home care have diminished. Hence, we must interpret hospital admission figures with caution.

With increasing age there is increased incidence of disease and impairment. However, studies on the methods of teaching adults to live peaceably with their limitations are still to be done.

Age Changes in Intelligence

A number of reviews have dealt systematically with intellectual changes during maturity and old age (41, 52, 54, 58, 59, 73). Average test scores begin to decline in the twenties and continue to do so at an increasing rate up to age 60. The extent and nature of the decline in test performance beyond the age of 60 is still uncertain, since adequate samples of adults in this age range have not been systematically tested. Changes with age vary considerably among different kinds of test material. For instance, the decrement with age is very small on vocabulary, information, and similarity test items whereas there is a significant decline in performance on numerical computation, opposites, series completion, picture arrangement, and analogies problems (35). Eysenck (27, 28) concluded that the most rapid decline was in tests which measure the ability to deduce relationships. Tests which require the subject to break away from old familiar mental habits and to adapt to unfamiliar situations yield lower scores in old subjects than in young (33, 34, 43, 66).

However, the diminished intelligence test scores observed in old sub-

jects should not lead us to the glib conclusion that all of the changes are due to age alone. Lorge (53) has shown that when allowances are made for perceptual and speed factors, the decrement in performance among the aged is very small. Unfamiliarity with test material and the testing situation may also play an important role in the lower performance scores. Defects in vision and hearing often limit the use of currently available nonverbal test material with elderly people. Furthermore, many tests in current use do not have sufficient material at low levels of difficulty or do not have high enough ceilings to test superior adult abilities.

Another major difficulty in interpreting age changes in test scores is that the same test items may not be sampling the same mental abilities at different ages. Thus, factors isolated from the intercorrelations of scores on subtests from the Wechsler-Bellevue Scales by the Thurstone contrived method with rotation of ages, gave somewhat different factor groupings among six different age categories (age 9 to 60 years) (2). In the 9- and 12-year-olds a general factor concerned with verbal ability and a factor concerned with ability to recognize relationships were fairly clear. However, with increasing age (25 to 29 years and 35 to 44 years), the factors became more difficult to identify. In the 50-to-59-year group, the average intercorrelations between subtests increased, and there was some evidence that the factors isolated were more homogeneous than in the middle-aged group.

Birren (6) has also subjected data obtained from administration of the Wechsler-Bellevue test to 99 subjects aged 60 to 74 years to a factor analysis. He too found high intercorrelations between subtests but after rotation to simple structure was able to identify four factors: V—verbal comprehension, C—closure, M—rote memory and I—induction. Further analysis of the correlation matrix (rotation of V to an oblique position) led to the conclusion that there was a large second-order factor consisting of stored information which is correlated with both V and C. Since the Wechsler-Bellevue does not include tests of many of the known primary mental abilities, it is of limited value in describing age changes. For this purpose many new tests, particularly nonverbal, need to be adapted and applied to aged persons.

Altho average values may show a decline in mental test performance with advancing age, two important findings must be stressed. The first is the wide range of individual differences in the performance decrement with age. Some individuals in their sixties may perform as well as the average of individuals 20 or 25 years their juniors. The second is the negative relationship between performance level and age decrement. Several studies have indicated that the age decrement is most marked in the subjects showing lower performance ability. The most able 5 percent of the population in a given test performance fail to show any significant age decrement. Altho it is true that the average performance of young university professors was better than that of old, Sward (85) was unable to find clear-cut signs of psychological decline among the bright and

successful senescent subjects. The question of whether or not superior adults suffer a significant decline in performance with increasing age is of considerable social importance and should be intensively investigated. It is necessary to make repeated tests on the same subjects over a period of years if we are to answer the important questions about age changes in intellectual capacities.

Age Changes in Learning and Memory

Since the attainment of satisfactory personal adjustment for older people must often involve the learning of new responses or learning to live within diminishing physical and perceptual capacities, it is important to know whether learning ability is altered. Since most psychologists have assumed that the methods of learning in adults do not differ significantly from those of young people, little fundamental work has been done in this field. A most significant contribution is that of Welford and his associates (96), who offer evidence that the methods utilized by adults are not the same as those of young people. Earlier studies, previously summarized (73), emphasize the importance of types of material used in testing learning ability. It is generally assumed that difficulties in learning encountered in adults are a function of the amount of reorganization of pre-existing habit patterns that is required. This is an attractive hypothesis but one which needs further experimental verification. Whatever the defects of older people may be, there is no evidence for the assumption that they can no longer learn. In view of the social and economic importance of retraining programs for middle-aged and elderly people for their utilization in employment, it is surprising that so little experimental work on defining optimum conditions for learning has been done.

The Role of the Social and Cultural Environment

The adjustive mechanisms available to the individual to secure satisfaction of his needs and goals are limited by the social and cultural environment in which he lives. Thus, in a rural environment, grandpa can sit on the porch and project the results of his tobacco chewing over the porch rail with impunity. The same behavior would scarcely be countenanced from a second-story apartment in the city. Our social pattern demands institutional care for extreme deviations in behavior. As previously stated, our present cultural attitudes toward the aged are ambivalent —on the one hand we reject the elderly by programs of forced retirement, and on the other we are solicitous in attempting to provide economic security for the years beyond age 65.

Altho growth may stop in the physical sense, development should continue thruout life. This concept has not yet gained general recognition or acceptance within our society. Nevertheless, it is one of the important goals of adult education. The role of adult education in altering the cul-

tural pattern and particularly the technics and methods employed in adult education has been considered in the June 1950 issue of the REVIEW. Education is the hope for the future solution of many of the problems of the aged.

The general philosophy of adult education defined as "any purposeful effort, not a major pursuit, toward self-development without legal compulsion" has been summarized by Bittner (10). Altho the educational needs of adults are still vague and undefined (46), there is a rising recognition of the values in education for older people (24, 45, 93). A number of special courses for elderly people have been developed within the framework of universities and university extension programs (64, 68, 88), but the problems of determining the appropriate content of such courses have not been solved. It is clear that many experimental courses of this kind need to be tried out. Perhaps our greatest problem is to discover ways and means of maintaining in adults the curiosity and urge for learning that exists in the young.

Summary

Successful psychological adjustment in older people is dependent on their goals, the performance capacities available to them, and the restrictions placed upon their activities by the social and cultural environment in which they live. With increasing age, the needs and goals of individuals undergo alterations, but the nature and extent of the changes are still largely unknown. Much more is known about age changes in capacity for mental and physical performance. Many of the known decrements in physical and perceptual capacities have little significance since they can be corrected, or adjustments in living can be made, if the aged persons can be taught to accept them and to live within their limitations. The ambivalent attitudes of our cultural pattern accentuate the difficulties of adjustment in older people since we have not yet defined socially acceptable roles for older people. Satisfactory solution of the problem depends on education, both of the individual and the community.

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CHAPTER IV

Personality Development

ROSS STAGNER

THE most interesting features to be detected in the literature on personality development in the 1950-1952 period are those relating to the changing focus in theoretical and research emphasis. There has been a substantial increase in the volume of writing on theoretical problems in the field, and particularly, the conceptualization of personality in perceptual terms has been expanded. In research, parallel to this, there has been an increased number of studies built around perceptual hypotheses, or using perceptual theory to interpret findings.

Neither of these trends, of course, is exactly new. The current concern with "perception of self" and "the environment as perceived" evokes memories of William James, George Herbert, and Mary Calkins. These concepts have simply been elevated once more to a position of prominence in psychology, just as the tachistoscope, so much used today, also had its vogue some 50 years ago. What is truly new is that psychologists are now integrating an enormous mass of material on child behavior, parent-child interaction, transmission of the culture, delinquency, neurosis, group membership, and group conflict in terms of a coherent and congruent set of categories.

Emphasis upon personality as a set of responses was natural in the theoretical climate of the 1930's, with a sophisticated behaviorism providing the main trend in theorizing. Hence we had research on frequencies of smiling, nail biting, and other specific behavior patterns in the child, but, often enough, precious little information about how these responses fitted into a picture of the child as a functioning individual. In recent years it has become clear that the same overt response has different implications according to the context, and that the same parental act has different significance for different children, depending on how they perceive it. A traumatic experience for a child who perceives himself as weak and helpless may be an experience leading to constructive development for the child who perceives himself as strong and capable. Thus, today, we still use data on the overt responses of child and parent, but we fit them into a total context: how is this act perceived by the parent? What is the meaning of this to the child?

Fortunately, this has not led to a narrow concentration of research on perception as an isolated function. The borderline between perception and other categories, such as motivation, actually seems to be breaking down. The new prevailing pattern might be described as a functional psychology of personality development, in which the child's growth is seen as a func-

tion of motivation, cultural background, family emotional atmosphere, and specific learning.

A book which owes its importance mainly to the success with which it has crystallized this trend and brought together in one place much of the relevant research, is the volume by Blake and Ramsey (9), presenting papers by a number of specialists in this area. While these are not all equally good, the general level is high. Development of general personality characteristics is treated especially well by Frenkel-Brunswik, but other excellent chapters are those by Klein, Bronfenbrenner, and Bruner. Dennis ably discusses the child's perceptual and cognitive development, and Rogers has a short but stimulating chapter on therapy as perceptual reorganization.

Another item of general interest, presenting a conception of how the child's personality becomes organized, is that of Tryon and Henry (85). Their viewpoint stressed the importance of group expectancies, how the family and other groups expect the child to behave; personality develops as he learns to perceive these expectancies and conform to them.

The number of articles which could be cited in support of this general trend is too great for inclusion here. The utility of the approach will become apparent as we consider some of the specific areas in which significant progress has been made.

The Importance of Early Experiences

Research findings have continued to stress early experiences as decisive factors in personality development. Ribble, of course, attracted wide attention with her rather extreme statements about the role of physical "mothering" of the infant. Pineau (61) subjected her arguments to detailed examination and showed that many of her assumptions were completely unjustified, especially as to the physiological instability which was said to necessitate physical fondling and care. Despite Pineau's logic, evidence continued to pile up regarding the great psychological importance of treatment of the infant; for example, Banham's observations (6) on the development of affection, gave confirmation on this point. Pattie and Cornett (58) found, as have other investigators, that a preponderance of unpleasant "earliest" memories was associated with personality disturbances in two of their three groups. Purcell (64) reported that college students with more unpleasant early memories were more insecure. Of course these memories did not extend back to infancy, but they may have reflected the subject's feelings about his early childhood. Bodman, MacKinlay, and Sykes (12) confirmed for English children what has generally been accepted in this country since the work of Goldfarb, that children placed in an institution at an early age fail to mature socially and personally at a normal rate.

An interpretation of these kinds of data in terms of homeostasis and perception was offered by Stagner (80). Once a child comes to perceive adults as sources of warmth and protection, confirming experiences will

be accepted and remembered, whereas conflicting experiences tend not to be noticed. On the other hand, a child who perceives adults as threatening and punitive will find all kinds of evidence to support his view and ignore evidence supporting the contrary opinion. Thus it may be that Ribble was right, but for the wrong reasons.

Parent-Child Interactions

If all mothers perceived their children as pleasures and gratifications, there would no doubt be fewer emotionally disturbed children. But, as Wallin and Riley (87) have noted, mothers even during pregnancy may have a rejecting attitude toward the new baby. As might be expected, in such cases the infant's personality development was found to be handicapped. This was true for the second child in a family, not so much for the first-born.

Continued interest was shown in the extent to which children resemble their parents. Phillips (60) found that parent and child might show the same disturbance, or the child might act out a repressed problem of the parent. Similar observations were made by Sperling (78). The findings can be interpreted in terms of imitation, or in terms of the child's perception of himself in a social role.

More fruitful is the attempt to identify the kinds of behavior by parents which are associated with certain personality problems of children. Cass (15) offered a framework for understanding mother-child relationships in terms of four variables: awareness, identification, projection, and control. She was concerned with the degree to which the mother was "aware" of the child's needs and problems (accuracy of perception) and the extent to which the mother imposed controls on the expression of needs. She also studied identification of child with parent, and projection of parental traits upon the child. As might be predicted, children with special personality problems were likely to have mothers who had little awareness of the child's needs, but who imposed a high degree of behavioral control. In a somewhat similar vein, McKeown (47) found that encouraging behavior was fairly common among the parents of his group of normal children but was quite rare among parents of schizoid or behavior problem children.

Sopchak (76) reported that boys who identified with their fathers had generally better adjustment (as measured by the Minnesota Multiphasic Personality Inventory), thus confirming what would be predicted from analytic theory. However, he found that girls who identified with their mothers tended somewhat toward poor adjustment! Since this contradicts other studies, we suggest that some unknown factor affected his results. Morris and Nicholas (52) published an interesting study on children with what they call "primary behavior disorders," related to the loose rubric of psychopathic behavior. Rorschach tests were administered to the child

and to both parents. They found that (a) children and parents had numerous traits in common, and (b) both parents often showed pathological personality trends, but not to the degree shown by the child. They suggested that some behavior difficulties are genogenic (determined by heredity), others psychogenic (products of experience), and others physiogenic (results of physiological difficulties).

The child's experience with his parents transfers to other adults, and he perceives the world as modeled to some extent on his early home life. Sorokin (77) studied college students who indicated on an attitude questionnaire that they believed people in general to be essentially "good" or essentially "bad," that is, those who accepted the possibility of peaceful, altruistic, cooperative relations with others versus those who felt that human social relations obeyed the "law of the jungle." The former group reported substantially more pleasant relationships with their own parents, the latter, more unpleasant relations with parents.

The difficulty of understanding parent-child relations without knowing the surrounding cultural context is vigorously illustrated by Erikson's excellent volume (25). He studied childhood in primitive societies in comparison with modern American culture. His observations indicate that manifestations of affection, anxiety, and aggression may be quite different in different cultures, and the significance of a specific parental act varies with the cultural background against which it is perceived.

Developmental Stages

The psychoanalytic approach to personality still dominated research on stages of development during this period. Three interesting investigations dealt with the so-called "oral character," or the trait of "orality," as it was phrased by those with doubts about Freudian typology. Goldman-Eisler (30), continuing her researches on the problem of orality, attempted to verify the hypothesis that early weaning is related to oral pessimism. By the use of factor analysis, she showed that it probably would be necessary to recognize two factors, early oral frustration and impulsive aggression, to explain the development of this pessimistic outlook on life. (As will be noted later, it is still generally agreed that frustration leads to aggression; however, early oral frustration may lead more specifically to an expectancy of deprivation than to hostility as such.)

Like many other investigators, Thurston and Mussen (84) found no relation between oral traits of college students (as indicated by Thematic Apperception Test protocols) and nursing gratification as reported by their mothers. The authors were therefore critical of Freudian theory. Not so Blum and Miller (11), who used a rather novel technic in their study of orality. They counted the number of nonpurposive mouth movements (thumb-sucking, licking, bubbling, tongue motion) on a time-sampling basis for young children. Those giving high proportions of such movements were, in general, those with an extreme interest in food (also

oral); and they tended to be social isolates, as the analysts predicted. There was also some tendency for them to show more need for liking and approval, more concern over giving and receiving, and less bored tolerance than the opposite group. All of these fit with the analytic interpretation of orality.

The "Critical Period" Hypothesis

The notion that the child develops thru a series of fairly uniform, predictable stages is associated with an insistence that there are specific "critical periods" during which certain traits are more likely to be determined than at other times. Stendler (81) examined the problems of socialization, with particular reference to overdependency, in the light of this theory, and found that the evidence generally favored it. The child, she asserted, tends to develop an expectancy that it will be cared for and protected, and if independence is not permitted at the crucial period, overdependency will result.

The "critical period" hypothesis is of a type which lends itself well to animal experiments for verification. Scott, Fredericson, and Fuller (73) worked with dogs and found general confirmation of the theory. Kahn (42) also demonstrated (with mice) that earlier trauma has a more demoralizing effect than one at a later age. Since the specific ages differ with different species, we shall have to have careful studies on human infants before we can determine the precise "critical periods" for the formation of particular aspects of personality.

Frustration, Aggression, and Delinquency

Another area of research interest during this period was that roughly delineated by the so-called "frustration-aggression hypothesis." Hollenberg and Sperry (37) provided experimental confirmation of the hypothesis that a highly frustrated child would be aggressive in doll play. Children subjected to excessive control at home showed a significantly greater frequency of aggression than those not so restrained. Sears (75) confirmed this, noting also that the relationships may be complex. His interpretation of attacks on parent-dolls (that the children were surprisingly low on anxiety about parental punishment) probably should be rejected in favor of the view that children quickly learn under what circumstances it is safe to express aggression. This may be especially true when the need to act aggressively is strong. Rabe (65) showed that mice likewise were more intensely disturbed by a frustrating situation if it closely followed another frustration—in other words, that frustration effects were cumulative. This, of course, supports the studies on human subjects.

Negativism as a phase of the child's personality is likely to be acute about the ages of two and three years. Ausubel (4) offered an interpretation of this phenomenon in terms of the frustration suffered by the child

when parents stop providing "unlimited service" and begin imposing demands. He called this phenomenon "ego devaluation" and suggested that aggressive negativism was the only ego defense available to the child.

Delinquency is often a consequence of aggression by the child against parents and other authority figures. Jackson (39) and Cass (16) reported that family factors were often involved in the determination of delinquency. A disturbed emotional atmosphere, with little awareness of the child's needs, seemed to be important. Schachtel (71) found Rorschach evidence to support the view that delinquent behavior was a form of aggression against authority. Kates and Harrington (43) obtained somewhat roundabout evidence for the same conclusion. Those delinquents who had membership in a "supporting group" (one having an anti-social code) did not improve under permissive group treatment, whereas another group, characterized by excessively strong, aggressive impulses and no supporting group, benefited materially by such permissive handling. Hathaway and Monachesi (35) showed that the MMPI can be used with some success to predict delinquency in high-school children. Their study is unique in that they actually administered the personality test and followed up the subjects two years later. Most so-called "predictive" studies are made *ex post facto* and are subject to a variety of vitiating factors.

One of the most important studies of delinquency ever undertaken came to a somewhat disappointing end. Powers and Witmer (62) published an over-all report on the Cambridge-Somerville Youth Study, which began in 1935. After an elaborate matching process, 325 boys were placed in a T (treatment) and 325 in a C (control) group. Each group included both prospective delinquents and prospective nondelinquents. Those in the T group received special personal attention from a counselor, plus medical care and some special tutoring as needed (but no psychotherapy or family modification). At the end of the study various indices showed an actually greater frequency of overt delinquent behavior among the T boys! Thus the view that "all a boy needs is a good friend to keep him out of trouble" goes by the board.

Social Class and Personality

No mention was made in the preceding section of studies showing that delinquency is related to social class status, since this has been proved too many times already. What is needed is a better analysis of the social class differences in family treatment of children, in expectations imposed upon the child, and in his perceptions of possible goals and ways of attaining goals. Material progress can be reported in this more fundamental approach to the problem of social class as a factor in personality development. Cooper (20) and Apple (3) offered general discussions of the expectancies, rewards, and punishments encountered by the child as he learns to adjust to a culture and a class-stratified society.

Aberle and Naegele (1), in a good article marred by lack of concrete data, showed how middle-class fathers unconsciously "blocked off" certain possible lines of development for their sons. Role expectancies were defined and the son required to adapt to this pattern. The middle-class ideology in America has traditionally required more postponement of pleasure, and Ort (57) therefore predicted that middle-class boys would show more role conflicts than working-class boys. His data clearly supported this prediction. Stouffer (82) dealt with conflicts resulting from role expectations of friendship versus authoritative groups.

Centers (17) showed that adolescents manifested class consciousness and followed the adult pattern of evaluation of occupations. However, the adolescents showed even more upward displacement of their own class status than did adult groups, thus presumably storing up more conflicts for themselves. Girls showed more upward displacement than boys—perhaps merely a function of their lesser degree of contact with economic realities. With older groups, less upward displacement was noted. It is probably significant that Phillips (59) found more evidence for personality difficulty among junior high-school students whose self-evaluation of class status deviated from a status assigned on objective indices. (This could indicate either wishful thinking or conflict induced by the incongruity.)

Social groups tend to differ in the permissiveness of training, middle-class families putting more pressure on their children. Roy (70) found that there were exceptions to this. Restrictive control of preschool children, she reported, decreased with such factors as greater parental education, and more space in the home. Drucker and Remmers (22) surveyed 1000 junior high-school students and found greater frequency of personality maladjustments with lower economic status of family, with parental education less than high school, and with Catholic religious affiliation. However, comparisons of personality problems across economic and class lines offer difficulties. Ellis and Beechley (24) studied 1000 child-guidance clinic patients. When age, sex, and intelligence were equated, the children of large families were found to have less serious emotional disturbances than children of small families. We might infer that in a large family, even a modest amount of emotional deviation by a child is upsetting to the parents and causes them to refer the child to a clinic; whereas parents with one or two children will tolerate more, and will refer a child only for serious problems. An alternative possibility is that problems arising out of economic frustration are more superficial than those arising out of the failure of the child to conform to middle-class standards.

Some of the problems of the middle-class child seem to arise from the fact that clear-cut role models are not offered to him. For instance, Rabban (66) found that working-class children adopt their appropriate sex roles earlier than middle-class subjects; this may be related to the fact that breadwinner status, authority, etc., are more likely to be divided in middle-class homes. Klatskin (44) found evidence that class differences in child rearing were being decreased by current public health education programs.

All of these social class interactions with personality development must be evaluated in the light of American culture as a whole. Maslow (50) edited a special number of the *Journal of Social Issues* devoted to discussions of the culture-personality relationship. While some of the articles were disappointingly thin, the topics discussed are significant and suggestive. The impact of American industrial organization on personality, the developing feeling that one must worry if he is not "having fun," and the personality characteristics fostered by the American culture—these are important. Joffe (41) asserted that the American culture is being modified by an excessive prolongation of adolescence. If young people develop the idea that they must have fun at all costs, and adults refuse to abandon this "fun culture" for mature responsibilities, our country has some real problems ahead. And as these individuals encounter grim reality, they must either painfully abandon old habits and precepts or escape into neurosis or psychosis.

Ethnocentrism and Prejudice

Prejudice between members of different racial and social groups is an explosive problem in the world today. The volume of publications in this area is encouraging, at least in the sense that psychologists are aware of the problem and are actively in quest of relevant data.

Omitting many articles which, in effect, merely confirm the painfully obvious fact that prejudices exist, we may cite a few which offer some new facts or relationships. Ammons (2) showed that even by the age of four, white boys showed clear-cut evidence of anti-Negro prejudice in a southern community. (Many investigators had held it to develop somewhat later.) Springer (79) demonstrated racial prejudices in Hawaii, an area hailed for its general lack of overt discrimination. Zeligs (88) noted that the rationalizations given by children for their prejudices now center more on customs and cultural variation, whereas before the war they had offered physical differences as excuses. The point, of course, is that hostilities continue to be handed down, but the changing cultural climate provides new interpretations of the nature of the out-group. (Note, for example, how easily we switched from "hate the Nazis" to "hate the Communists"!)

The California studies of prejudice, especially as reported in *The Authoritarian Personality*, provided a focus of research and a center of controversy during this period. Psychoanalytic and perceptual theory formed a somewhat uneasy partnership in this project, which has been broadened by several new studies. Frenkel-Brunswik, whose contributions to the earlier research had been well executed, published a new study (28) on the parent-child relationship and prejudice. As in the earlier work, she found that prejudiced children show rigid dichotomizing (good and bad are sharply separated), fear of imaginary dangers, marked aggressiveness, and exaggerated adherence to conventional values such as cleanliness and order. To some extent these characteristics were imitations of parents; in other respects they seemed to reflect a deep insecurity about the child's

relation to his parents. Himelhoch (36) and Gough and others (32) reported studies of prejudice and personality which were generally compatible with the Frenkel-Brunswik investigation. These studies, like that of Campbell and McCandless (13), used objective devices and thus are protected to a substantial extent against the accusation that the California investigators read their own prejudices into their data on prejudice.

An original contribution by Frenkel-Brunswik was the relation of prejudice to "intolerance of ambiguity," the need to classify everything (and everybody) into sharply defined groups. Block and Block (10) confirmed her finding; they used the autokinetic phenomenon as device for estimating "intolerance of ambiguity." O'Connor (56) also confirmed it, using a verbal attitude scale consisting of statements such as "there is more than one right way to do anything." The correlation between the California E scale (prejudice) and the A scale (ambiguity) was .55. She also found that her prejudiced subjects made lower college grades than the unprejudiced; and they did more poorly on a syllogistic reasoning test. This part of her study was confirmed by Rokeach (68), who found that the prejudiced person is literally "narrow-minded." He asked his subjects to give definitions and associations to religious, social, and similar stimuli. The high ethnocentric group used narrow, concrete, specific conceptions, whereas the low group used more broad abstractions.

Can the California studies be considered as giving a general or only a special answer to the psychology of prejudice? One approach would be to use the California instruments in other areas where culturally defined prejudices followed a different pattern. Christie and Garcia (18) compared University of California students with cases from a southern university. The latter group scored higher on both ethnocentrism and authoritarianism, thus confirming the expected relationship. Prothro (63), on the other hand, found that in the deep South, the pattern of prejudice against Jews and other minorities was different from the anti-Negro pattern. In the South, many anti-Negro persons failed to show the other features of the "authoritarian personality." Clearly then, cultural factors determine whether the prejudiced individual will have the "authoritarian" pattern.

Harris, Gough, and Martin (34) found, for California children, a positive association between child's prejudice and parental authoritarian control. No parallel study for a different area could be located. It was interesting, however, to note the work of Radke-Yarrow, Trager, and Miller (67) in Philadelphia. They found that religious prejudice of parents tended to be reflected fairly accurately by the children, but the majority of children were anti-Negro irrespective of parent attitude. Again, it looks as if culture lays down a broad framework within which individual dynamics can operate. On the other hand, if we get out into another culture area, we must re-examine our psychodynamic interpretations of personality—particularly in relation to group hostility.

Altho he presented no original data, Luchins (45) did the field a service by his thoro analysis of the California studies. Some of his criticisms

were apparently sound (for example, the need for independent criteria of prejudice and of personality patterns, and the need for study of the middle group on prejudice), but others were not. For example, if some of his objections were taken literally, they would throw out the whole hypothetico-deductive approach to research, which has been a major factor in psychological progress in the last two decades. Luchins also ignored several studies which met his criteria of objectivity—perhaps because they were published during the interim between writing and publishing his article. The fact seems to be that, today, enough of the original California findings have been confirmed to be quite impressive. Improvement and clarification will result as cultural areas are compared and other limiting conditions defined.

Problems of Minority Children

It is natural to move from the personality of the prejudiced to the personality of the scapegoat. Papers by Goff (29), Goodman (31), and Clark and Clark (19) dealt with some of the emotional and social difficulties of the Negro child. It was not surprising that the Negro children showed a wish to identify themselves with the white child (preferred status) and encountered conflicts as a result. Nor was it startling to learn, from Grace and Lohmann (33), that Negro children show more compliant behavior than whites in hypothetical conflict situations. Actually, of course, the hope of social progress rests on studies of the persecutor, not of the scapegoat; the emphasis is still in the right place.

Sociometric Investigations

While the concern of psychologists with perception and inner aspects of personality has been widespread, studies of social acceptance and such external variables has not disappeared. Several have offered ingenious combinations of the two approaches.

McGuire and Clark (46) studied the characteristics of those accepted and rejected by their age-group at the high-school level. The extensive interview quotations were somewhat more informative than the text in revealing how subtly the school "culture" was transmitted to newcomers, and how appropriate were the concepts of "social climate," "perception of persons," "definitions of situations," and so on. The students quickly learned to perceive certain characteristics as "unacceptable," altho they could not explain why these were undesirable.

A possible depth interpretation of this phenomenon was offered by Miller and Stine (51). The hypothesis (analytically oriented) was that high-school students who were sociometrically high (accepted and sought after) would have fewer pregenital trends (orality, anality, passivity) indicative of relative immaturity. Using story completions, they confirmed the hypothesis except for anal trends, which were commoner in the high

group than the low. (The data of Blum and Miller (11) also showed more orality in social isolates.) As anal characteristics have been alleged to be "middle-class" features, it may be that class valuation was more important than dynamic influence in determining social acceptability for subjects with these traits.

Jennings (40) noted a relationship between sociometric status and attitude toward authority. The "under-chosen," isolated girls looked upon the housemother as a personal authority; the "over-chosen," sought-after girls viewed the housemother almost exclusively in terms of her treatment of the whole group; the middle group fell between these two attitudes toward the authority figure. Scheffler and Winslow (72) failed to confirm her findings; however, they lumped together eight different areas of authority (for example, religious, political, business) without trying to find out whether these were interrelated. Since Jennings' subjects were evaluating an authority figure who was personally close and real to them, a relationship to sociometric status would be much more likely to appear; attitudes toward abstract authorities may be functions of verbal influences.

Age trends were reported in two studies. Horrocks and Buker (38) found that friendship fluctuations steadily decreased from age 5 to 10. When the data were joined to an earlier study of adolescents, it appeared that stability in friendship increased continuously from 5 to 15. Ausubel, Schiff, and Gasser (5) likewise found a steady increase in "sociempathy," or the accuracy of perception of the child's own social status and the status of others in his group. Thus it seems that the instability of early childhood may be a function of "perceptual errors" in evaluating others and in judging social acceptability.

Heredity

The importance of heredity as a limiting or determining factor in personality development has been played down in recent years. Some signs appeared in the 1950-1952 period that interest in heredity is on the upswing. Eysenck (26) did an involved study of 25 pairs of monozygotic and dizygotic twins. He eventually arrived at an estimate of 81 percent hereditary determination of individual differences in neuroticism. Why a statistician as able as Eysenck would reach this conclusion on so small a group and without an independent sample for cross-checking is not clear. Bender (8) interpreted her data on anxiety in schizophrenic children as evidence for a biological condition underlying the schizophrenic breakdown, and the data of Thetford (83) could be similarly interpreted, altho he did not commit himself on this point.

Technical Problems

The search for methods of evaluating personality more adequately continued thruout the period. We can mention only a few articles.

Carp (14) raised serious questions about the validity of the concept of psychological "constriction" by demonstrating that scores for constriction on the Rorschach, on play tests, and on drawings failed to agree with each other and also failed to agree with ratings. Cox and Sargent (21) raised some pointed questions about the validity of judgments by clinicians. Martin (48, 49) reported evidence that cast doubt on the validity of Werner Wolff's test for security in children.

Mummery (53) obtained data supporting the validity of the Mummery Ascendance Score for five-year-old children; Rosenzweig and Mirmow (69) reported further validation of the Rosenzweig Picture-Frustration Study for children; and Elias (23) provided evidence for the validity of the Elias "homelessness" scale. The fact that the three studies confirming test validities were conducted by the authors of the respective tests, while those rejecting test validities were conducted by persons not ego-involved, raises some significant questions regarding test validation problems. Evidently the psychology of personality still has many hurdles to pass in the course of scientific advancement.

In Conclusion

Space limitations have necessitated omitting many interesting studies which might have been reviewed. It was also impossible to point out weaknesses in many of the studies which have been quoted approvingly, or strong points in those which were criticized. Some areas, such as the personality traits of the handicapped and the impact of school conditions on personality had to be eliminated completely.

The psychology of personality development has made impressive progress since the end of World War II. The fusion of clinical, perceptual, sociological, and other approaches, which has been underscored in this review, offers great hope for the future. For at least a few years, the rate of gain looks as if it may be positively accelerated.

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CHAPTER V

Learning Theory

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SOMETIMES the best way to understand contemporary events is to examine them in historical perspective. Such will be the method followed in the present review and evaluation of recent developments in the psychology of learning.

The Reflex Arc Versus Consciousness

An examination of psychological literature around the year 1900 reveals the beginnings of a struggle between two conceptions of this science which was to occupy future theorists and investigators in an extraordinarily vigorous and creative controversy. Like most of his predecessors, Ladd (20), writing in 1902, defined psychology as "the systematic description and explanation of the phenomenon of consciousness, as such." But at that point Dewey (5), in a paper published in 1896, had already voiced the growing dissatisfaction with this approach and had indicated the conception which was to go far toward replacing it. Said Dewey:

> That the greater demand for a unifying principle and controlling working hypothesis in psychology should come at just the time when all generalizations and classifications are most questioned and questionable is natural enough. It is the very cumulation of discrete facts creating the demand for unification that also breaks down previous lines of classification. . . . The idea of the reflex arc has upon the whole come nearer to meeting this demand for a general working hypothesis than any other single concept. It being admitted that the sensori-motor apparatus represents both the unit of nerve structure and the type of nerve function, the image of this relationship passed over into psychology, and became an organizing principle to hold together the multiplicity of fact. (5:357)

While "behaviorism" was not to find its most explicit spokesman for another decade, it is clear that by the turn of the century the study of "consciousness, as such" was rapidly giving way to a lively interest in something called *behavior*. Thus, as early as 1904 Cattell was able to observe:

> It seems to me that most of the research work that has been done by me or in my laboratory is nearly as independent of introspection as work in physics or in zoology. The time of mental processes, the accuracy of perception and movement, the range of consciousness, fatigue and practice, the motor accompaniments of thought, memory, the association of ideas, the perception of space, color-vision, preferences, judgments, individual differences, *the behavior of animals and of children*, these and other topics I have investigated without requiring the slightest introspection on the part of the subject or undertaking such on my own part during the course of the experiments. It is usually no more necessary for the subject to be a psychologist than it is for the vivisected frog to be a physiologist. (4:180, italics added)

Why the reflex arc was so attractive a concept at this juncture it is not hard to discover. Physiologists, by disregarding consciousness and con-

centrating upon the "involuntary" responses of organisms, were manifestly making more progress than were psychologists, dedicated as they were to the "description and explanation" of consciousness. But more important still, the reflex, with "stimulus" and "response" as its anchor points, put the organism into a vital relationship with its *environment* and thus articulated with the growing impact of evolutionary thought.

Whereas psychologists had been concerned traditionally, and relatively unfruitfully, with a particular process occurring *within* living organisms, the new approach put the accent upon *external* events: stimulation and overt reaction. And despite philosophical and other objections which were to be raised against it, this reorientation provided a release from deepening pessimism and opened hopeful new vistas. With a single, clean stroke, the organism—the "O" as we shall later designate it—was obliterated, and in its place were put two abstractions, *S* and *R*, with only a thin, equally abstract arrow connecting them. While this bold conceptual innovation, first fully chronicled and rationalized by Watson (48), was "oversimplification" with a vengeance, it was not an unproductive one and set psychologists on a road which was to lead to much undiscovered territory.

Conditioning, or "Stimulus Variability"

In his excellent history of "reflex action," Fearing (7) repeatedly refers to the quality of "invariability" which reflexes are alleged to possess. From the outset this property was an embarrassment to psychologists who were attempting to make the reflex arc the cornerstone of a new psychology, embarrassing chiefly for the reason that anything approximating an adequate theory of behavior *must* provide for the occurrence of change, plasticity, learning. The classical conception of the reflex was in this respect singularly deficient.

A partial solution to the problem was, however, soon to emerge. In 1901, while studying certain digestive reflexes, notably those of salivation, a Russian physiologist by name of Pavlov (37) observed what he later referred to as the "so-called psychic secretion of some of the glands." The "physiologically adequate" stimulus for salivation is, of course, food (or some irritant) placed directly in the mouth. But Pavlov soon noted that his laboratory subjects (dogs) would salivate upon the mere *sight* of food. His investigations were soon to show that any *other* stimulus, such as a sound or touch, which *regularly preceded* the introduction of food into the mouth, would likewise acquire the capacity to elicit the salivary reflex.

In one respect, then, reflexes were *not* "invariable": the stimuli capable of producing them could be extended by the simple expedient of regularly pairing a new, formerly neutral stimulus with the original, physiologically adequate one. Considerably later it was also to be shown that reflexes can be altered by "habituation," which is almost certainly a form of learning (8). Such findings have caused some writers, for example, Holt (12), to

consider the possibility that learning may even be involved in the *development* of the reflexes.

Pavlov termed this process "conditioning." It was to increase greatly the attractiveness of the reflex-arc concept for psychologists as the basic unit of behavior, and Pavlov himself saw many of the new possibilities thus opened up, and vigorously exploited them.

> Our starting point [he said] has been Descartes' idea of the nervous reflex. This is a genuine scientific conception, since it implies necessity. . . . Thus a stimulus appears to be connected of necessity with a definite response, as cause with effect. It seems obvious that the whole activity of the organism should conform to definite laws. (37:7)

Not only is the concept of the reflex scientific; it is congruent with the self-regulatory property manifested by all living organisms. As Pavlov observed:

> If the animal were not in exact correspondence with its environment it would, sooner or later, cease to exist. . . . The animal must respond to changes in the environment in such a manner that its responsive activity is directed towards the preservation of its existence. . . . Reflexes are the elemental units in the mechanism of perpetual equilibration. Physiologists have studied and are studying at the present time these numerous machine-like, inevitable reactions of the organism. (37:7-8)

In England the move to establish an objective psychology had made extensive use of the concept of *instinct*. Pavlov was quick to recruit this movement to his own, and his strategy was this:

> We owe to the English philosopher, Herbert Spencer, the suggestion that instinctive reactions are reflexes. Ample evidence was later advanced by zoologists, physiologists, and students of comparative psychology in support of this. (37:9)
>
> It follows from all this that instincts and reflexes are alike the inevitable responses of the organism to internal and external stimuli, and therefore we have no need to call them by two different terms. Reflex has the better claim of the two, in that it has been used from the very beginning with a strictly scientific connotation. (37:11)

But perhaps the greatest appeal which Pavlov's approach held for psychologists came from the fact that it articulated with an interest of long standing. Psychologists had often concerned themselves with stimuli as the source of "sensations" and had talked, albeit somewhat vaguely, about "perceptions"; but it remained for Pavlov to put the problem of "signaling" and meaning in a broader frame of reference, one which biologists as well as psychologists could appreciate. Like Sherrington (40), Pavlov was struck by the capacity of living organisms, thru the "special senses," to react to significant objects and events *at a distance* and in this way to achieve very great biological advantages; but it was the latter investigator who gave this observation its broader, more sweeping implication.

Noting that the "psychic reflexes" will occur in an animal only if its cerebral cortex is intact, Pavlov attempted to put his theory most generally as follows:

> How can we describe, in general, this difference in the dynamic balance of life between the normal and the decorticated animal? What is the general mechanism and law of this distinction? It is pretty evident that under natural conditions the normal animal must respond not only to stimuli which themselves bring immediate benefit or harm, but also to other physical or chemical agencies—waves of sound, light, and the like—which in themselves only *signal* the approach of these stimuli; though it is not

the sight and sound of the beast of prey which is in itself harmful to the smaller animal, but its teeth and claws.

Now although the *signalling stimuli* do play a part in those comparatively simple reflexes we have given as examples, yet this is not the most important point. The essential feature of the highest activity of the central nervous system, with which we are concerned and which in the higher animals most probably belongs entirely to the hemispheres, consists not in the fact that innumerable signalling stimuli do initiate reflex reactions in the animal, but in the fact that under different conditions these same stimuli may initiate quite different reflex reactions; and conversely the same reaction may be initiated by different stimuli. (37:14)

Here, surely, was a new platform for psychology, with exciting research potentialities! The basic phenomenon of conditioning, of "stimulus variability" (or "substitution"), soon lent itself to a wide range of investigations concerning such processes as extinction, spontaneous recovery, disinhibition, generalization, discrimination (differentiation), etc. Indeed, by the third decade of this century, research employing a conditioning methodology and conditioning concepts had reached such proportions as to make it seem to many that "conditioning" encompassed *all* learning and *most* of what could be called psychology, in the fully scientific sense of the term.

But in the two decades just past, the hopes and claims earlier expressed in this connection have become progressively less sanguine. *Something* was wrong. An increasing number of paradoxes began to arise which could not be resolved either on the basis of orthodox Pavlovian theory or any reasonable extension thereof (11). Hull (15), a long-time student and admirer of Pavlov's work, broke sharply with the Russian physiologist's conception of the nature of "reinforcement," that is, the basic process whereby learning takes place. And Pavlov's own attempt, in the latter years of his life, to extend his principles into the field of psychiatry was characterized by a resounding lack of success (38).

At mid-century we are therefore faced by a serious enigma: that campaign to establish a truly scientific psychology which, in its early phases, seemed to have greatest promise has come to a virtual standstill. What is the reason? Was the program intrinsically unsound from the beginning? Or is it sound but incomplete? In order to answer these questions, we must turn back and briefly trace the historical course of a great parallel development in psychological theory and objective inquiry.

Learning as Problem Solving

Prior to 1900 the most influential American writer on the subject of "habit" was William James. Phrases and concepts from the chapter on this topic in his *Principles of Psychology* (16) found their way into the common culture as well as professional literature and exercised great influence in both areas. His central hypothesis, expressed in a variety of picturesque and vivid images, held that habits are strengthened whenever they occur. Thus "repetition, or exercise" was the "first law of habit"; and, as a corollary, it was believed that habits could similarly be weakened

or eliminated only by an "act of will" which prevented their occurrence for a sufficiently long time to allow for a process of natural decay to obliterate the "brain paths" on which the habits were presumably dependent.

> A path once traversed by a nerve-current [James said] might be expected to follow the law of most of the paths we know, and to be scooped out and made more permeable than before; and this ought to be repeated with each new passage of the current. (16:108)
>
> Dr. Carpenter's phrase that our *nervous system grows to the modes in which it has been exercised* expresses the philosophy of habit in a nutshell. . . .
>
> If practice did not make perfect, nor habit economize the expense of nervous and muscular energy, he [man] would therefore be in a sorry plight. (16:112-13)

James was not, however, unaware of *another* form of learning. In chapters on "The Functions of the Brain," "Some General Conditions of Brain-Activity," and "Association," he showed a good grasp of what was later to be termed conditioning. In fact, he even went so far as to reproduce Meynert's earlier (1874) "brain-scheme" (really a constellation of reflex arcs) purporting to show how a child, once burnt, will thereafter avoid touching a candle flame. This is a clear instance of "avoidance conditioning." James was thus well aware of the role of both contiguity *and* "exercise," or "practice," as processes whereby learning may take place.

But it remained for one of James's students, Thorndike, to pick up the concept of "habit" and carry its analysis forward in a unique and useful way. Thorndike was certainly one of the first "behaviorists" in the sense of perceiving that psychology *as science* could be advanced more by studying behaving organisms than by introspective and speculative treatises concerning consciousness, a position he vigorously defined in his first major research report in 1898 (42). Here he was concerned primarily with *method*, but a little later he introduced a major innovation in theory. Thorndike (44) continued, in the Jamesian tradition, to accept (at least for a number of years) exercise as the first law of habit. He said:

> When a modifiable connection is made between a situation and a response, that connection's strength is, other things being equal, increased. (44:2)

But Thorndike went beyond James in proposing a second, his not well-known and oft-quoted Law of Effect:

> When a modifiable connection between a situation and a response is made and is accompanied or followed by a satisfying state of affairs, that connection's strength is increased: When made and accompanied or followed by an annoying state of affairs, its strength is decreased. (44:4)

While his early researches won for Thorndike a secure reputation as a proponent of objective methods in psychology, his notions regarding the action of punishment and reward—in part, no doubt, because of the particular phraseology in which they were often couched—were less readily received. Indeed, as late as 1931, Thorndike (43) was prompted to observe that his law of effect had been, for the three decades since its first formulation, an "unpopular doctrine." This had been a period during which "conditioning" had swept the field, but Thorndike never capitulated.

Tho poles apart in theory, Pavlov (37), writing in 1927, gave Thorndike

credit for introducing in America objective experimental methods at about the time that Pavlov, "being then quite ignorant of his researches," was beginning his own work in Russia. "We may fairly regard the treatise by Thorndike, *The Animal Intelligence* (1898), as the starting point for systematic investigations of this kind" (37:6).

Thorndike described his own misgivings concerning the conditioned reflexes as follows:

> I must admit that the reported phenomena of the conditioned reflex are a mystery to me in many respects. Just what their relation to ordinary learning is I do not know, but I am not convinced that they show its fundamental pattern and most general principles. (43:113)

This statement of faith (or doubt?) has been, in large measure, vindicated by developments during the past 20 years, particularly by the work of Hull and his students. In his 1943 book, Hull (15) advanced both empirical and logical support for the view that *all* learning is dependent upon what he called the principle of "primary reinforcement." He said:

> *Whenever a reaction (R) takes place in temporal contiguity with an afferent receptor impulse (s) resulting from the impact upon a receptor of a stimulus energy (S), and this conjunction is followed closely by the diminution in a need, . . . there will result an increment . . . in the tendency for that stimulus on subsequent occasions to evoke that reaction.* This is the "law" of *primary reinforcement.* (15:71)
>
> It has already been suggested that the hypothesis as to the reinforcing state of affairs adopted in the present work is distinctly related to that of Thorndike's "law of effect." (15:80)

Hull felt that Pavlov, on the other hand, had seriously erred in proposing a form of reinforcement independent of that provided by drive reduction. He said, in part:

> Pavlov differs from the law of reinforcement by regarding as the critical element of the reinforcing state of affairs the occurrence of S_s, in this case the *onset* of shock. On the other hand, the critical element in the reinforcing state of affairs by our own hypothesis is the reduction in the drive receptor impulse . . . which accompanies the reduction of the need, i.e., reduction of the physiological injury to the tissue of the feet, caused by the termination of the shock.
>
> It is an easy matter to show the inadequacy of Pavlov's formulation as a general theory of learning. . . .
>
> It is not difficult to understand how Pavlov could have made such an error. His mistaken induction was presumably due in part to the exceedingly limited type of experiment which he employed. (15:78-79)

Hull attempted to show, in considerable detail, that Pavlovian learning, or conditioning, is really just a "special case of ordinary learning [drive-reduction] reinforcement," thus establishing, at least *per* hypothesis, a unified conception of the learning process, one which, as we have seen, is obviously related to Thorndike's long-debated Law of Effect.

But in certain respects, Hull's attempt to establish a single-process theory of reinforcement in terms of drive reduction has fared no better than did Pavlov's effort to make reinforcement exclusively dependent upon the contiguity, or paired presentation, of stimuli. It is not necessary here to review all of the evidence and arguments which have now been advanced by way of indicating the inadequacy of Hull's theory as a *universal* expla-

nation of learning (28). Suffice it to say that Hull's attempt to establish a monistic conception of learning seems to have bogged down about as completely as did Pavlov's earlier effort. The task which is therefore now before us is to reappraise the contributions of these great investigators of the recent past and see if they can be integrated to open up the way for vigorous and productive new scientific accomplishment.

A Constructive Synthesis

Sensing the inadequacies inherent in both the conditioning and instrumental-learning formulations, a school of writers which may be loosely referred to as the Wholists have kept up for the past quarter of a century a barrage of criticisms, both serious and trivial. They have, in effect, proclaimed a "plague on both your houses" and attempted to show that the real key to psychological knowledge lay in a different direction. While writers of this persuasion have from time to time reported empirical findings which are interesting and valuable in their own right, they have performed their greatest service, it would seem, in continuing to remind us of the more ultimate objectives which a comprehensive conception of learning must set for itself and in fomenting dissatisfaction with answers that were too simple and too easy. Allport (1) and many others deserve much credit in this connection; but Lorenz (21) probably expresses the views of most sober thinkers, not only in psychology but in biology, when he says that wholism, by its very nature, lacks both the materials and the tools required for sound scientific progress. However, in the dialectical sense, it has not been without value. Lorenz says:

> The conception of the "whole" was to vitalists the very essence of what never could be explained, being the direct consequence of a preternatural factor. Particular stress was laid on the thesis that a whole could never be explained by synthesis of particulate elements. To this fatal resignation of analysis on the vitalistic side mechanists replied by trying to synthesize all the systems of behavior on the basis of too few elements. This "atomism" is an error very characteristic of mechanistic schools. This optimistic attempt was, of course, doomed to failure, but not before it had brought valuable results. Even very crude simplisms have done less damage to the progress of science than resignation.
>
> It is an everlasting merit of Gestalt psychologists to have been the first consciously to introduce the method of a truly correlative analysis of organic systems. . . . Gestalt psychology should have undertaken to correct the atomistic errors of behaviourism and of reflexology and to introduce the method of a correlative analysis into the study of behaviour.
>
> There is not a single organic system which is really a "Gestalt," nor one that is a mosaic. Every real organic system is built up on *both* principles, mutual interaction of correlated parts playing a role as well as particulate elements influencing the whole in one-way causation. (21:224-25)
>
> Vitalists overrate the "whole" and totally neglect the particulate element, mechanists neglect regulative interaction and overrate those particulate independent elements which they happened to succeed in isolating. Of these errors the mechanistic one is obviously far less detrimental to research than the "Gestalt" psychological one. (21:226-27)

It has now been shown that while neither the elementalism of Pavlov nor that of Hull (or Thorndike) is completely self-sufficient, the wholistic

approach has likewise failed to generate a theoretical system of high explanatory and predictive power. The possibility remains, however, that contiguity theory and drive-reduction theory, taken *together*, may transcend the limitations of each alone and may carry us substantially nearer that understanding of the organism-as-a-whole which others have so heavily stressed.

In 1947, the present writer (27) reviewed the mounting support for the position that Pavlov and Hull were *both* right (tho both also partly wrong) and has since added further logical and experimental considerations in substantiation thereof (28, 32). But perhaps the most dramatic evidence for a "two-factor" conception of learning is the fact that the Polish neurophysiologist, Jerzy Konorski, on the basis of an almost completely independent line of work, has come to virtually the same position. In the English translation of his 1948 volume, *Conditioned Reflexes and Neuron Organization* (18)—which is only just now becoming known in this country—Konorski maintained that a comprehensive behavior theory must, at the very least, distinguish between "conditioning, type one" (sign learning) and "conditioning, type two" (solution learning); and he concluded his stimulating presentation with these words:

> For so long as the great edifice of knowledge built up by Pavlov was guided and extended under the direction of that great scientist's genius, it could continue to grow despite its isolation, and despite the fundamental inadequacy of its construction. But since Pavlov's death this science, rent as it is with intrinsic contradictions, submerged beneath a great mass of inexact and arbitrary interpretations of facts, isolated from cognate fields, and with its own specific system of terminology and concepts which is wholly foreign to other branches of neurophysiology, has been unable to make any further progress. And unless a fundamental readjustment, such as we have attempted to make in the foregoing pages, is not made in its basic concepts and standpoint, the physiology of higher nervous activity is bound to suffer degradation in status, and Pavlov's priceless heritage will be largely wasted. (18:260)

And on an earlier page Konorski had already observed:

> It must be pointed out that Hull has provided a similar analysis of the experiments [on "conditioning, second type"] we have described. The difficulty which he came up against was due to his attempting (in our view ineffectively) to force the phenomena he analysed into the scheme of conditioned reflexes of the first type. (18:246)

The present writer would add to Konorski's analysis the observation that more accurately, Hull's attempt was to account for *all* learning, including "conditioning, type one," in terms of principles which clearly apply to "conditioning, type two"—and to it only.

A review of Konorski's book or of some of the other studies which have been cited will show how great are the gains in accepting the reality of both conditioning and instrumental learning as two basic, and basically different, learning processes. However, it now appears that in none of these recent works have the potentialities of this dual conception of learning been fully grasped and exploited. In the writer's own previous statement of the two-factor position, he has been inclined to assume that these two forms of learning exist and function, so to say, side-by-side in living organisms, and he has represented them diagrammatically as shown in

Figure I. But it can now be seen that much of what has been said earlier was really pointing toward a conception of these two learning processes which puts them, not side-by-side, but ***end-to-end***, as shown in Figure II. It appears appropriate to reconstruct the justification for this particular arrangement.

One of the things which the two-factor position immediately makes clear is that the concept of "conditioning" has been considerably overextended. For reasons which have been developed elsewhere (18), it now appears that the only truly conditionable responses are those mediated by the autonomic nervous system and the visceral and vascular tissues. Overt, behavioral responses, involving the central nervous system and the skeletal musculature, are never, strictly speaking, "conditioned responses." They are, or may be instead, the efforts which the organism makes to solve problems *created by* conditioned reactions. Such efforts may, of course, be alternatively activated by *primary* drives, such as hunger, thirst, etc.

A simple illustration will clarify the foregoing remarks. If a buzzer precedes an electric shock applied to the foot of a dog, the first form of learning is conditioning, whereby the buzzer becomes capable of producing a *fear reaction*. Once this has occurred, the dog, upon subsequent presentation of the buzzer, has a *new problem* to deal with and may now learn, on a problem-solving basis, any one of numerous possible responses for terminating the buzzer (and fear) and also (if the experimental situation is sensibly rigged) for averting the shock.

As early as 1946, Mowrer and Lamoreaux (34) published an article entitled, "Fear as an Intervening Variable in Avoidance Conditioning." And Brown and Farber (3) have since proposed that *all* emotions can probably be usefully conceptualized in objective behavior theory as intervening variables. Thus to suggest now that sign learning and solution learning are *sequential*, rather than parallel processes, is merely to make explicit an implication which has been pretty obvious for some time. Yet Figure II is apparently the first published diagram attempting to represent this relationship. The diagram published in 1950, in *Learning Theory and Personality Dynamics* (28:594), is however a close approximation. Similar diagrams will also appear in Osgood's forthcoming volume (36).

In conditioning, the stimuli, or at least the CS ("conditioned stimulus"), is typically an *external* event of some sort, and the R is typically an *internal* event, such as fear; whereas, in instrumental learning, the stimulus, or "drive," is typically *internal* and the R *external*. What we have manifestly been doing in the past is trying to make all S-R sequences "one-step" affairs, instead of acknowledging that they are often parts of a "two-step" sequence. In looking so industriously for the *external* signs of a CR like fear and leaving our interest and observations there, we have largely neglected its further role in the economy of the "total" organism. Thus, salivation is essentially an internal, physiological reaction; and Pavlov's conditioning experiments with this reaction always involved a surgical operation which, literally, brought it to the body surface. While Pavlov

FIGURE I

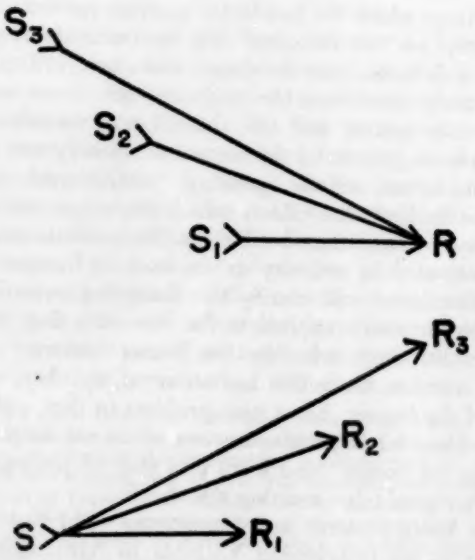
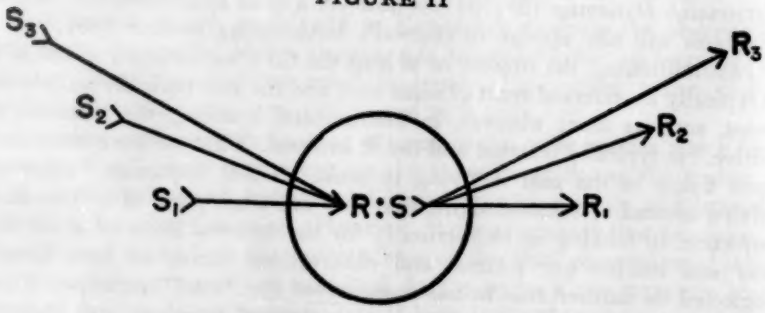


FIGURE II



was, of course, well aware of the digestive and other functions of salivation under normal conditions, he was oblivious to—or at least took no interest in—the *appetitive* accompaniments of this reaction. These, as we now know, have important drive properties, which may activate internal-external sequences, that is, *behavior* in the nonphysiological sense of the term. The external-internal and internal-external type of distinction between responses is certainly implied by Skinner's (41) distinction between those reactions which he called "respondents" and those which he called "operants." As is well known, Skinner was one of the first psychologists to explore the two-factor conception of learning, tho his aversion to subjectivism tended to keep him from formulating a unified two-stage conception of behavior.

It may be objected that there is really nothing novel in what has just been said. For example, has not the concept of response "chaining" often been used in the past? Yes, to be sure; but "chaining" is a device employed, rather feebly in most instances, by inveterate conditioned-reflexers as a would-be explanation of such performances as are involved in problem-box and maze learning. What is proposed here is by no means the same.

Or it may be pointed out that such an eminent writer as Tolman (47) has for more than 20 years been stressing "intervening variables" and that even Hull has made extensive use of them. Tolman certainly deserves much credit on this score, but the intervening variables in which he has been particularly interested are of a "cognitive" variety which do not readily lend themselves to the type of analysis here proposed. Professor Tolman's theorizing, as represented by his most recent publication (45), has taken a course which has become increasingly difficult to follow.

In Hull's 1943 book (15) there is a good deal of reference to the role of "intervening variables," or "constructs"—such as "habit" and "drive" —in formal theory construction; but there is an almost complete absence of anything approaching the type of thinking represented above in Figure II. Under the impact of experimental facts which Miller (24) and others have been piling up, Hull (13), in his *Essentials of Behavior* (1951), for the first time gingerly introduced *fear* as a systematic concept; but because Hull continued to reject the two-process view of learning, his management of this concept was unsure and awkward (16:21). The generally confused nature of Hull's formulations in this connection is well illustrated by the introductory paragraph of his chapter on "Secondary Motivation."

> It is a matter of common observation that situations which are associated with drives themselves become C_D's. Consider, for example, the case involving tissue injury. The response leading to escape from the injury gets connected to the stimuli and to the traces of those stimuli which are associated with the onset of the injury through the resulting cessation in the drive stimulus discharge (S_D). These antedating stimuli when later encountered will therefore give rise to more or less realistic reproductions of these movements. Now, these antedating stimuli are the new C_D's, and the proprioceptive stimuli activated by the associated internal or "fear" reactions become the S_D's of the *secondary drive* or motivation. Finally, the intensity of this combination of stimuli, especially of the proprioceptive internal or "fear" stimuli, through the principle of stimulus-intensity dynamism gives them their distinctive motivational potentiality. (13:21)

Implications and Corroborative Evidence

The Problem of Punishment. According to Thorndike's Law of Effect, reward directly strengthens stimulus-response connections and punishment directly weakens them. Learning is thus a *reversible* process. But such a view overlooks the fact that punishment leads to *conflict,* which it should not do if it operated as the Law of Effect suggests. And it also overlooks the fact that "punishment," applied in other settings, can be used to *motivate* behavior, rather than inhibit it.

The generally unsatisfactory nature of much past theorizing concerning punishment has been discussed elsewhere (29). Here there is space only to note that this phenomenon is readily accommodated in the scheme shown in Figure III (which is merely an elaboration of Figure II). Here we start with some drive (hunger, thirst, or the like), S_{D_1}, which habitually produces and is reduced ("satisfied") by some response, R_1. In the course of its occurrence, this response will produce proprioceptive or other stimuli, S_{s_1}. If, now, a punishment, S_{D_2}, that is, a sharp increment in drive ("pain"), is applied just after or as R_1 occurs, the circumstances are right for conditioning to take place: S_{D_2} will produce the (unconditioned) fear reaction, R_2, and S_{s_1} will become capable of independently eliciting this reaction. When, subsequently, R_1, under the impetus of S_{D_1}, starts to occur, the drive of fear, S_{D_2}, is aroused, and the only way this second drive can be resolved is for R_1 to be interfered with, in the simplest case, by some *antagonistic response,* R_3.

If nervous impulses were always and exclusively "excitatory," then inhibition, brought about by punishment, would have to occur *peripherally,* that is, a response which is being instigated by one drive could be blocked only by another drive acting in such a way as to innervate muscles antagonistic to those involved in the first response. That inhibition is indeed often, at least in part, peripheral is indicated by the common figure of speech, to "stiffen" oneself against "temptation"; (Larry N. Solomon has also called the writer's attention to the expression "bored stiff," as used in social situations in which one is inclined to make responses which would be "impolite"); and in the laboratory it has been shown that if a dog has been taught to flex a forelimb as an instrumental response and has then been punished for making this response, presentation of the stimulus which initially produced the flexion reaction will now cause the dog, if the punishment was sufficiently intense, to contract the *extensor* muscles of the leg (18, 37). But since organisms which are in such a state of conflict, or inhibition, often do not show the degree of muscular tension and tonic rigidity which the purely peripheral mechanism would seem to demand, various possibilities of *central inhibition* have been suggested and to some extent supported by neurophysiological researches. For further pursuit of this matter the reader is directed to the works of Fulton (10) and Brazier (2).

This account of inhibition thru punishment seems adequate to its purpose and is founded upon the assumptions (a) that there are *two* learning

FIGURE III

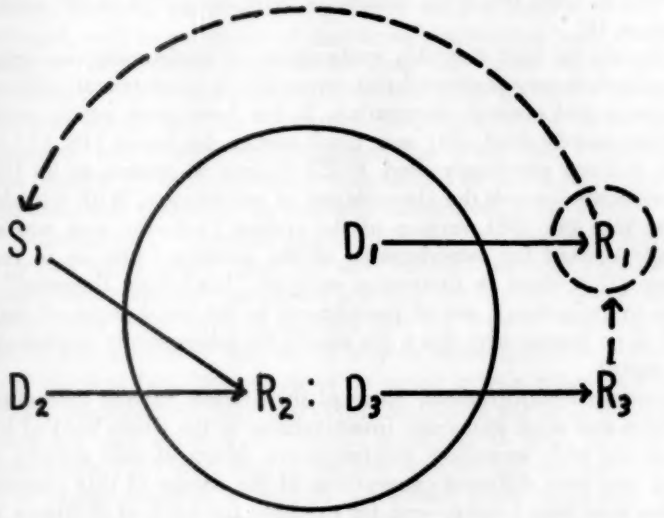
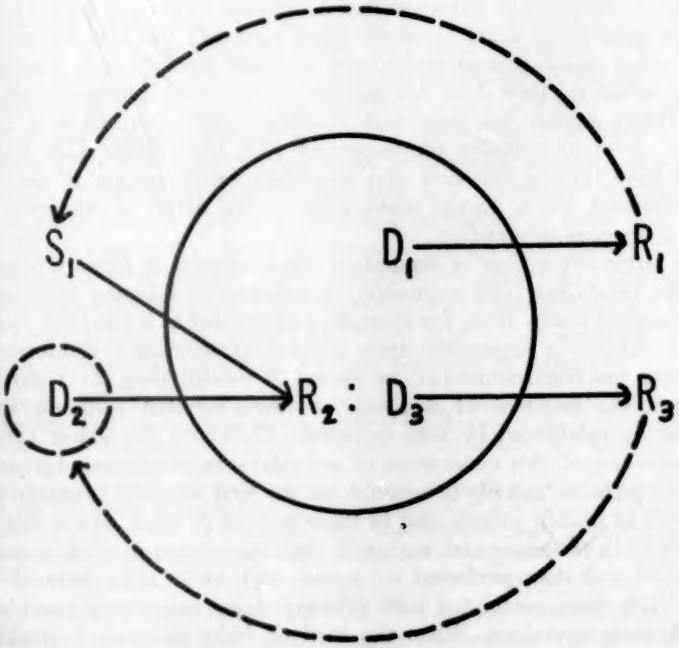


FIGURE IV



processes, conditioning and problem solving, and (b) that responses acquired in these two ways commonly form *sequences* of the kind shown in Figure III.

It should be said that this explanation of punishment, as opposed to Thorndike's theory of direct habit reversibility, is congruent with common experience and clinical observation. It has been most nearly anticipated by Miller and Dollard (25) and, much earlier, by James (16, 17) in some of the writings previously cited. Hull's theoretical system, in its 1943 version, virtually ignored the phenomenon of punishment. With the admission of fear into the 1951 version of the system (13), the way was at least partially opened for consideration of the problem; but, as in the 1943 volume (15), there is discussion only of "Inhibitory Potential" (as it relates to extinction), not of punishment in the usual sense of that term. There is no reason why this topic should be subsequently neglected to the same extent.

Secondary Reinforcement. Some of the liveliest current theoretical controversies and most important investigations in the whole field of learning have to do with secondary reinforcement. Much of this activity centers around two very different conceptions of the nature of this phenomenon.

It has long been known—see, for example, the work of Williams (49)—that specific stimuli or situations which have been associated with basic satisfaction, such as hunger reduction, become capable of serving, in their own right, as "reinforcing agents." In other words, an organism will be rewarded—this can be demonstrated in various ways—not only by reduction in some basic drive (primary reinforcement) but also by an object or by other circumstances which have regularly foretold such a reduction. The question is: How does this process of secondary reinforcement operate? Hull's answer has been that secondary reinforcement is a "conditioned" form of primary reinforcement (13, 15). Miller (23, 24) and others have favored the view that secondary reinforcement is simply the reinforcement which occurs when a secondary drive, of whatever kind, itself undergoes diminution.

The latter conception of secondary reinforcement is thoroly consistent with the two-factor (and sequential) conception of learning delineated in the preceding pages. Thus, for example, punishment as it has been analyzed in this chapter is dependent upon a form of secondary reinforcement: once fear has been connected, by means of conditioning, to a particular response, the response of stopping or reversing that response will be secondarily reinforced by fear *reduction*. Elsewhere the writer (28, 31) has made use of this conception of secondary reinforcement for quite a different purpose, namely to account for the first stage of language learning, both in human infants and in those species of birds which can learn to "talk." Here the central notion is that conventional word noises are first tried and then perfected by babies and birds alike because these noises have been associated with primary drive reductions provided by their human caretakers. When the bird or baby succeeds in making a

noise which is a "reasonable facsimile" of one commonly made by an adult human being in the context of primary reward, such a sound, when self-produced, will have some of the same comforting and reassuring (secondarily reinforcing) qualities as does the sound when made by others. Konorski (19) has independently advanced the same mechanism as responsible for the learning involved in teaching a dog to "shake hands."

"Reasoning" and Mediational Responses. One of the chief criticisms that has been leveled at learning-theory approaches to psychology has been that trial-and-error behavior, no less than conditioning, is "blind," "automatic," "mechanical," "unmeaningful," and thus incapable of providing a satisfactory explanatory basis for the "higher" mental processes and behavioral feats commonly exhibited not only by human beings but also by certain other organisms. It appears that the type of learning theory outlined in this chapter is well on its way to meeting this objection.

One of the first facts that needs to be noted in this connection is that conditioned responses, as here conceived, may have not only motivational properties but also guiding or "cuing" functions as well. Tolman (46) and Muenzinger (35) were among the first to comment upon the tendency of rats at choice points in a maze to move their heads from side to side, as if trying to determine in this way which path to take. At first it may appear that the rats are thus trying to discover some *external* lead, but such tell-tale indicators in the environment will have been carefully eliminated. The only remaining inference is that by means of this VTE (vicarious trial-and-error) behavior, the animal is really producing proprioceptive stimuli which, on previous trials, have been associated with "good" or "bad" consequences of having actually turned and gone one way or the other in such a situation. The animal, in short, is trying to determine how it would *feel* to go this way or that! As indicated at greater length elsewhere (28), this type of activity can properly be regarded as a primitive form of *reasoning* and demonstrates how emotional reactions can serve to *guide* behavior which is motivated by hunger or some other basic drive. More specifically, these emotional reactions, cued off by the head movements, are "orientors" and "organizers" rather than "originators," mediating and directing but not constituting instrumental behavior proper.

As Osgood (36) has pointed out, Hull laid the groundwork for the study of mediational processes. As early as 1930 he wrote:

> A reflective consideration of the habit mechanisms involved in anticipatory defense reactions reveals a phenomenon of the greatest significance. This is the existence of acts whose sole function is to serve as stimuli for other acts. We shall accordingly call them *pure stimulus acts.* (14:515)
>
> Such behavior sequences have great biological survival significance because they enable the organism to react both to the not-here and the not-now. Incidentally it accounts for a great deal of the spontaneity manifested by organisms.
>
> The concept of the pure stimulus act appears to be the organic basis of symbolism. (14:524)

But Osgood has also noted that Hull "never fully explored the implications of this mechanism" (36:60). One of the reasons for this was Hull's

determined effort to see all learning as dependent upon a single process and his reluctance to admit emotions to the status of psychological constructs. One of the first reasons for so admitting them was the discovery that the *overt* reactions which living organisms make to danger signals are often *radically unlike* the overt reactions made to the "unconditioned stimulus," that is, the danger itself. Only by positing fear as an intervening variable (the true conditioned response) can this phenomenon—which has been discussed in detail by May (22) and by Mowrer and Lamoreaux (34)—be satisfactorily accounted for. An exploratory investigation by Nygaard, described by Osgood, neatly illustrates the way in which "intelligent," "insightful" behavior may be produced and very simply explained by positing fear as an intervening or mediating response. Osgood says:

> Rats are initially given intermittent shocks while held in a small enclosure where the only effective response is *crouching*. The experimental animals have a buzzer sound paired with these shocks, but control animals do not (they hear the buzzer as often, but not coupled with shock). Then all animals are trained to make a *barrier-jumping escape response* to shock which cannot be anticipated and has no signal associated with it. Once this escaping response has reached a criterion latency following the onset of shock, test trials with the buzzer are made. (36:78)

On the test trials it is common for the experimental animals to make an overt response to the buzzer which they have never made to it before, that is, they are likely to make the "barrier-jumping escape response," whereas the control animals, that is, those which received the same preliminary shock training but without the associated buzzer, are much less inclined to make such a response. As Osgood observes:

> Since the experimental animals have never had the buzzer stimulus associated with barrier jumping, its occurrence in the test situation must be based upon the mediating anxiety reaction common to both situations. Since the anxiety mediator has been associated with both crouching and barrier leaping, and the buzzer only with crouching, as overt responses, we must consider the prompt occurrence of barrier leaping to the buzzer in the new situation a case of "intelligent transfer" to instrumental sequences "appropriate to" the total situational context. (36:78)

An experiment demonstrating the use of an internal response (emotion) other than fear for mediating "insightful" behavior has been carried out by Mowrer, Kunberger, and Kardash (28, Chapter 11).

The treatment of response mediation, particularly as it applies to the psychology of language, which will appear in Osgood's forthcoming book (36) will be unusually thoro and penetrating. Here it will be seen that this writer explicitly adopts a two-stage response sequence as minimally necessary for an S-R analysis of certain important forms of behavior. He differs, however, from the present writer in continuing, with Hull and others, to believe that there is probably only *one* learning process. However, he gives an excellent review of various two-factor formulations.

Two other psychologists who have become interested in the relationship between learning theory and language problems are Brown and Dulany. In an unpublished manuscript entitled "A Stimulus-Response Analysis of Language and Meaning" they, too, stress the role of mediation; but they

disagree with Osgood in favoring, not only a two-stage conception of behavior, but also a two-factor conception of learning. They say, in part:

> In this section arguments have been advanced which militate against the identification of meaning with acts which are either overt or instrumental. . . .
> This leaves us saying that, if meaning is to be a response, it must be, as Osgood observes, a mediating implicit response. We should further suggest that this response ought to be classically conditioned. The value of these formulations depends upon the evidence that can be accumulated to indicate that meaning possesses the functional properties of a response.

Learning Theory and Neurosis. One of the most elaborate attempts to date to deal with personality problems and their treatment in terms of learning theory is the recent book by Dollard and Miller, entitled *Personality and Psychotherapy* (6). The central thesis of this book, and one that is equally central to most of Sigmund Freud's writings (9), is that the neurotic person is suffering from conditioned responses, notably *fears*, which have outlived their usefulness and realism and "which in their inexpedience obstruct the stream of life."

The present writer believes that a different conception of neurosis, based upon the type of thinking outlined in this chapter, is more defensible. The essence of this conception is this, that neurosis is less a matter of mis-, mal-, or overconditioning that has been produced by overly severe or misguided parents, than it is a matter of the afflicted individual having acquired certain tricks at the level of instrumental or solution learning which *protect* him against conditioning (especially in the nature of "punishments") which, in the long run, would be decidedly to his advantage and best interest. Reduced to the simplest possible form, this view suggests the schematic diagram shown in Figure IV. Because of space limitations this view cannot be properly expanded here, but it has been presented in considerable detail elsewhere and in several articles soon to be published.

Learning Theory and Social Processes. Most learning researches have been carried out with isolated subjects; and when, as sometimes happens, it is discovered that the subject is interacting "socially" with the experimenter, such interaction is most unwelcome. Yet most of the learning of human beings occurs in a distinctly social context, a fact that becomes particularly impressive when one attempts to understand and deal therapeutically with neurotic persons.

Some years ago the writer carried out a series of experiments with rats, as yet only partially reported (26), in which two or more subjects were put into a standard situation and their resolutions of the resulting "social problem" systematically studied. Somewhat later Mowrer and Kluckhohn (33) tentatively introduced *another person* into a stimulus-response analysis of certain learning problems. And recently Sears (39) has discussed this type of extension of conventional learning theory. A few brief excerpts will give the general tenor of his paper.

> I have already made reference to the desirability of combining individual and social behavior into a single theoretical system. . . .
> Among psychologists, Newcomb, with his exposition of role expectancy, and

Festinger, in his studies of group cohesiveness, clearly exemplify the trend toward combination. In the main, however, in spite of their long prepossession with social influences on the individual, psychologists think monadically (39:478)

But if personality and social behavior are to be included in a single theory, the basic monadic unit of behavior must be expandable into a diadic one. A diadic unit is one that describes the combined actions of two or more persons. A diadic unit is essential if there is to be any conceptualization of the *relationships* between people, as in the parent-child, teacher-pupil, husband-wife, or leader-follower instances. To have a science of interactive events, one must have variables and units of action that refer to such events. (39:479)

It is not necessary or possible here to follow the specific treatment which Sears gives to this problem in the remainder of his paper. Enough has been said to show that learning theorists are beginning to think socially, "diadically," and to suggest that this may soon become an area of considerable scientific and scholarly activity. It is believed that two-factor learning theory, especially when it is elaborated along lines suggested in this chapter, will prove especially adaptable in this connection.

Summary

In this chapter an attempt has been made to put contemporary developments pertaining to learning theory into historical perspective and in this way establish some guideposts indicating the probable direction of future developments in this field. Around the turn of the century a kind of revolution occurred in American psychology which soon shifted the accent from the study and description of "consciousness, as such" to the reflex-arc concept. Pavlov and his school expanded this concept to incorporate the phenomenon of conditioning (sign learning), while Thorndike, Hull, and others, using equally objective approaches, identified and extensively studied trial-and-error (solution learning).

Various writers have attempted to found a complete psychology of learning upon one or another of these principles, but it is now clear that it is not a question of either-or but of *both*. Moreover, it is now apparent that these two forms of learning exist and function, not side-by-side, but end-to-end: sign learning is the process whereby *external* events come to produce *internal* drive states, and solution learning is the process whereby *internal* drive states produce *external*, overt behavior. We thus advance from a simple, and pretty clearly inadequate, S-R psychology to an S-R:S-R psychology. By drawing a circle (O) around the R:S part of this sequence, we not only rediscover the "organism" but we redeem it from the state of "emptiness" to which extreme behaviorism condemned it, and thus begin, realistically, to examine the organism-as-a-whole.

Finally, an attempt is made to sketch some of the implications which this system of thought has for (a) the problem of punishment, (b) secondary reinforcement, (c) "reasoning" and mediational responses, (d) neurosis and therapy, and (e) social psychology.

Figure I. Diagrammatic representation of two forms of learning, conditioning or stimulus substitution (above) and trial-and-error or response

substitution (below). S_1 may be thought of as the so-called unconditioned stimulus; S_2 as a first-order conditioned stimulus; and S_3 as a second-order conditioned stimulus. In like manner, R_1 may be thought of as a first but ineffective response to some drive or problem situation, S; R_2 as a second attempted solution; and R_3 as a third and successful reaction. Here stimulus substitution and response substitution are represented as more or less *parallel* processes; compare Figure II.

Figure II. The same diagrams as shown in Figure I placed, not side-by-side, but end-to-end, with a circle, or O, added to represent the organism. The colon is used to represent a response-stimulus connection, as opposed to stimulus-response connections (arrows). This sequential arrangement of the two kinds of learning—sign learning, whereby secondary drives become attached to new stimuli, and solution learning, whereby new responses become connected with a particular drive—offers a number of new explanatory possibilities (see text). It provides a scheme whereby "any stimulus" can become functionally related to "any response" more realistically than by either "reflex chaining" or wholistic conceptions.

Figure III. Schematic representation of the operation of "punishment." Some drive (for example, hunger or sex), D_1, produces some overt response, R_1, which leads to, or in the past had led to, a reduction in D_1. However, R_1 now causes a second drive ("pain" of some sort), D_2, to impinge upon the organism, O. Simultaneously other stimuli, including proprioception from R_1, impinge upon O. For simplicity, we may represent this concomitant stimulation by a single stimulus, S_1. One of the reactions to D_2 will be the internal response of fear, R_2, which becomes attached, by conditioning, to S_1. Subsequently, incipient performances of R_1 produce S_1 and R_2. R_2 produces the fear drive, D_3. The response which most directly reduces D_3 (and is selectively learned) is one which blocks R_1. It is, of course, possible for D_2 to be of such a nature as to require for *its* reduction some overt response which, like R_3, will block R_1. But the more usual case is one in which D_2 serves merely to elicit R_2 so that S_1 can become conditioned to R_2. The final "cycle of punishment," starting with R_1, is indicated by the sequence of broken and solid lines. The circling of R_1 by the dotted line extending from R_3 is used to indicate the blocking, or inhibition, of R_1 by R_3. (For reference to the possibility of central "short-circuiting" in connection with response inhibition.)

Figure IV. Precondition of neurosis represented schematically. As indicated in Figure III, if a response, R_1, is punished by being followed by D_2, the resulting overt reaction tendency, R_3, is commonly one which blocks R_1. It may develop, however, that R_3 is a *different kind* of reaction, namely one which is "defensive" in that it keeps D_2 from recurring (see broken line extending from R_3 to D_2 and encircling the latter). If O can thus avoid being "caught in the act," this leaves R_1 free to occur (with suitable precautions) and keeps the S_1-R_2 connection from being reinforced. However, such a strategy of "avoiding consequences," or "cheating," is likely (in human beings, at any rate) to produce guilt which, if in turn

dealt with defensively (viz., by repression), sets the stage for neurosis. This interpretation is to be contrasted with the view that neurosis arises when a forbidden form of gratification (R_1) is punished so severely and *so successfully* that neither it nor any alternative mode of gratification can henceforth occur. In the present paper, the assumption is that the neurotic is one who has become adept in *consequence avoidance* rather than one who is a victim of excessive *response inhibition.*

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CHAPTER VI

Psychological Theory as a Determiner of Experimental Pattern in Child Study

BOYD McCANDLESS and SIDNEY ROSENBLUM

Definition of Theory

IN GENERAL, psychological theory as discussed by Gustav Bergmann, in an unpublished manuscript available to the authors, is or should be based on concepts which ultimately, by longer or shorter definitional chains, are defined by immediately observable bits of behavior, and every psychological law should include at least one such concept. Also, a theory consists of a set of laws deductively connected, some of these (fundamental laws, basic laws, axioms) allowing jointly for the deduction of others (theorems) and the deduction of laws as yet untested. In terms of this definition, the authors have decided to restrict their study to three roughly demarcated theories: (a) learning or behavior theory, (b) field and Gestalt theory, and (c) psychoanalytic theory.

It is rather clear in the first place that no such formal structure has as yet been attained in a theory of human behavior. Rigorously speaking, then, few experiments have been theoretically derived. However, in each of the three "theory areas" many theorems have been proposed, a number of empirical relationships have been developed and referred back as evidence related to a theorem of one of the systems, and many experiments and studies have been done with reference to the "theorems" and as checks on previous theorem-related research. This chapter has been broadened to include such studies and experiments.

A second reason for the relative paucity of theoretically determined research in the area of child study is probably the demand for realistic services made on the research worker in this field. Theory, at first glance, has seemed little related to such necessities. Recently, however, the fragmented and unrelated nature of the empirical findings has resulted in the conviction on the part of many people in the field that theoretical integration is a pressing problem, and that theoretical programs of research should constitute a major part of the activity in the field of child study.

A third reason for the rarity (and frequently, the poor quality) of theoretical research in child study is the relative lack of theoretical sophistication possessed by research workers. Most training centers for child research workers have become aware of this situation and seem to be making real progress in correcting it. The relative upsurge of theoretical experimental work in very recent times can be noted in the dates of research reviewed in later sections of this chapter.

The combination of inadequate theoretical grounding and social urgency has resulted in overgeneralization and inappropriate generalization of research. This, in turn, has produced some revulsion against theory on the part of the "hard-headed empiricists" as well as some criticism of the whole field of child study on the part of those who see the "experts" solemnly advocating today what they were renouncing yesterday. Another aspect of this situation is the confusion existing in many workers' minds between value and science, which, of course is again partly a product of the social urgency which underlies the whole field of child study. As Bergmann points out, the basic flaw of some theoretical systems is not in what they have to say, but in their insistence that their way of saying it and presumably, their way of studying it is the only way in which it can be said or studied.

Scope of Review

The authors have been compelled to do much arbitrary selection of materials. By and large, purely clinical studies have been excluded except where reference to theory is made explicit and detailed. This has resulted in the exclusion of the majority of projective technics studies. The authors have not included social class research, except where it is related to one of the three major areas of theory listed above, and have limited drastically the list of level of aspiration studies and frustration, stress, and failure studies, excluding those where the aim was primarily to elicit and describe a repertoire of behavior. Detailed documenting of "parent preference" studies has not been done, altho some of the omitted studies are purportedly derived from psychoanalytic theory. Most sociometric studies were judged to be normative and were excluded.

Studies Derived from Learning Theories

Transposition Studies

Kuenne (42) and Alberts and Ehrenfreund (1) made studies which use Spence's (78) theory of discrimination learning as their frame of reference. Kuenne hypothesized that the processes postulated by Spence to underlie transposition behavior in animals were also operative in young children, but that in the case of older children who possessed the ability to make verbal responses, transposition behavior would become verbally controlled (that is, cued to such verbal responses as "bigger," "higher," "longer"). She utilized children from three to six years of mental age and divided them into two matched groups, with instructions to choose the smaller stimulus of the largest of six pairs of stimuli. She then presented her subjects with test stimuli *near* the training pair and *far* from the training pair to test the hypothesis that the far transposition tests would result in significant differences between children of different age levels,

as well as between those who did and did not verbalize the solution of the problem (either spontaneously or under questioning), whereas the near transposition test would not reveal these differences. Results indicated that, with very few exceptions, all children were able to transpose successfully in the near transposition test, but only older children were able to do so in the far situation. She also discovered that a high positive relationship existed between the subjects' verbalizations of the size aspect of the problem and their transposition scores on the far test: older children tended to verbalize the size cue significantly more often than younger children.

In a study using a procedure similar to Kuenne's, Alberts and Ehrenfreund (1) secured results that they considered striking confirmation of the Spence theory.

A recent research by Terrell (84) suggested by Spence's theory and Kuenne's extension of it, used 48 prescho-l children as subjects and involved a three-stimulus discrimination situation and two transposition tests. An analysis of the results suggested that transposition behavior of young children is in part affected by whether they received training on a specific instance of a concept ("middle-size") or training on a number of instances of the concept, and in part by whether or not the children had a verbal name available for the concept.

Mediated Generalization Studies

Several studies have been concerned with an empirical investigation of specific concepts and variables directly suggested by Hullian theory. Two which warrant special attention are by Birge (6) and Jeffrey (39). Both deal with secondary or mediated generalization, a phenomenon which can be described as the occurrence of a response to a stimulus to which it has never been conditioned when factors of primary generalization and initial tendency have been controlled. Birge was concerned with the role of verbal responses in the mediation of motor responses and the role of motor responses in mediating verbal responses. Since general procedures in both parts of her experiment were essentially the same, only the first will be described. In stage one of the design she presented her subjects (students from Grades III, IV, and V) with four boxes, each one having a different picture of some nonsense animal on its top. Subjects were taught to give one nonsense name to two of the boxes and a different nonsense name to the other two. In stage two, one of the boxes with each name was used, and the children were taught to reach for one box, under which they found candy, and not to reach for the other, under which there was no candy. In stage three, the subjects were tested for transfer of the motor response (that is, reaching for candy or not reaching) to the two remaining stimuli. Mediation was said to have occurred when the subjects reached for the box that had the same name as the box they had been trained to reach for in stage two. Subjects were divided into four groups on the basis of what verbalizations were required of them during the various stages of

the experiment proper. One group made the initially learned verbal response prior to the motor response in both the candy finding and transfer stages (stages two and three), one group made it in candy finding alone, one in transfer alone, and one in neither. Results indicated that the majority of children in all verbalization groups chose the box in the transfer situation that had the same name as the box they had been trained to choose in stage two. In addition, greatest generalization occurred in the group that overtly verbalized in both candy finding and transfer stages; least took place in the group that had not verbalized at all. The other groups fell between.

Jeffrey (39) investigated the relative effects of verbal and motor responses in mediating an instrumental act using 48 preschool children as subjects. In stage one all subjects were taught a motor response when shown a black stimulus and another motor response when shown a white stimulus. A gray stimulus was then presented to make sure that neither motor response was consistently elicited by that new stimulus. In stage three, one-third of the subjects learned to make the verbal naming responses to the black, white and gray stimuli, and two-thirds of them learned an additional pair of motor responses. In each group, one-half the subjects learned to make the same response to gray as to white while the other half learned to make the same response to gray as to black. A retraining session followed in which the verbal group and one-half the motor group were required to make the stage two response prior to making the stage one response to only the black and white stimuli. The other half of the group was also given a retraining session with just the two original stimuli but was not permitted to incorporate the second response. Stage three required all groups to make the stage one response when presented with the gray stimulus. The individual scores analyzed were the differences between the frequency of a given response to gray during test and retest situations. Mediation was said to have taken place when those children who had learned to make the same stage two response to gray as to black now made the same stage one response to gray as to black with greater frequency than they had in the original test. Results indicated that mediation occurred in all three groups, the most occurred in the verbal group, less in the first motor group. That motor group which had not incorporated the second response in the retraining session showed poor mediation, but the scores were significantly different from chance.

General Learning Study Trends

These studies merit the special attention they have received since they demonstrate that theoretical formulations originally intended to explain the behavior of inarticulate organisms can be extended successfully to the behavior of human subjects. Among other researches, the work of Greer (33) on "inhibition" and "extinction," Wischner (94) on the anxiety-reducing character of stuttering behavior, and Harlow (35) on learning

sets all demonstrate that certain antecedent and behavioral variables can be "experimentally translatable," so to speak, from animal to child subjects. A slightly different approach is exemplified by Rotter's "social learning theory" as described by Jessor (40) which is formulated directly in terms of human goals and needs. Two recent studies related to this theory are those by Cass (11, 12), in which she tested certain parent-child interaction variables, namely "identification," "awareness," "projection," and "control," using young adolescents as subjects. Tho in somewhat rudimentary form at present, Rotter's theory is encouraging in that it demonstrates the possibility of developing a systematic approach with which to explain and predict certain aspects of children's behavior.

The extension of Hullian theory, or some modification of it to complex, symbolic human behavior seems to the authors to represent one of the stronger trends in present child-theoretical research. It is perhaps one of the most promising approaches if for no other reason than that Hullian theory is the most carefully defined and logically consistent of the existing psychological theories. Programs of such research are being conducted at Yale, Iowa, and Ohio State, among others. Among the most promising of such experiments appear to be those concerned with verbal (and other) mediation and secondary generalization, concept formation, and symbolic behavior in general. However, as the next section demonstrates, experiments derived analogically from behavior theory have not been limited to "pure" learning nor to purely "cognitive" processes. Some of the behavior theory oriented investigators have also utilized field theory technics, which in some senses at least seem more directly related to "real-life" social situations than the traditional conditioning technics. (See, for example, Chapter 5 of this issue of the REVIEW.) The results of such experiments (18, 32, 40, 44, 45) have been very promising.

The Sears-Iowa Doll-Play Studies

Only those studies from the extensive series related to the methodology of doll-play which are derived or semiderived from theory, or that have theoretical implications are discussed in this section. It is difficult to place the doll-play studies within a given framework, as the interests of the workers have reflected a variety of theories including behavior theory and the frustration-aggression subsections of it as well as psychoanalytic theory. The doll-play technic itself has been intensively studied, and the influence of various methodological variations has been explored. In general, the technic is sufficiently familiar not to need review here.

One of the earlier theoretically applicable studies was that of Bach and Bremer (4) in which the authors were interested in whether the fantasy doll-play could be more adequately accounted for by (a) a psychoanalytically derived theory of delinquency based on unconscious desires to punish parents, or (b) the frustration-aggression hypothesis of behavior theory. The authors' conclusions were essentially in line with predictions

which might have been made from behavior theory; for example, delinquents showed no more fantasy instigation toward father dolls, appeared to be poorly "identified" with them, and tended to anticipate little punishment from them.

Bach (3) also investigated father-fantasies and father-typing in homes with father absent. He concluded that the absence of the father, when this absence was service connected and the mother presented a favorable picture of the father, resulted in idealistic and "feminine" fantasy pictures of the father as compared with a matched group of six-to-ten-year-olds with the father present in the home. The control subjects elaborated the fathers' aggressive tendencies. Bach concluded that when the father was absent, there was less instigation for aggressive fantasies and that the deprived or frustrated drive for paternal affection provided strong instigation for idealistic, wish fulfilling fantasies. In this study, theory as it might have been derived from a behavior-system appears to have been supported.

Sears (75), in a paper in which several studies were summarized, quoted doll-play findings which supported the hypothesis of more rapid reduction of anxiety than of aggression, due to differences in steepness of their gradients of generalization. This is a theoretical position educed in connection with the classical frustration-aggression hypothesis and related to behavior theory. Findings with preschool children in several studies supported this at a modest level of confidence: severely punished and frustrated children utilized parent dolls less as objects of aggression, altho they showed more fantasy aggression; they gained more rapidly thru two play sessions—where fantasy aggression was not punished—in their use of the parent dolls as recipients of aggression than did less punished and frustrated children. Analogical support for the behavior principle of stimulus generalization in the area of complex social behavior was also provided by the studies reported in this paper.

In another paper, based on observations of 42 three- and four-year-old preschool children, Sears (73) found support for a learning theory of dependency, altho his relationships thruout the study were low. Second children showed less dependency than first children. First children appeared to be more frustrated because of such impositions as rigid eating-scheduling, than second children. This reduction of goal attainment (both mother contact and food-getting goals) seemed to increase anxiety, which in turn increased drive, which in turn increased the instigation to mother-controlling behavior (that is, dependency behavior) as a means of satisfying the two original drives, as well as of reducing anxiety. The generalization gradient was considered to serve as the mechanism for the transfer of this behavior to more general social situations where unsatisfied drives existed and/or where mother-surrogates were present. These data were based on maternal interviews, teacher (preschool) ratings, and observations of the concerned children.

Pauline Sears (72) in a long, seminormative study of the doll-play of 150 three, four, and five-year-old children, mostly lower middle-class,

reported findings fitting a general social-learning, behavior theory point of view: representatively, boys showed more rough physical aggression than girls, girls showed more verbal aggression, but less total aggression; children first in birth order showed less aggression than children second in birth order; boys with father absent showed less aggression than boys with fathers present, and boys were affected more by fathers' absence than were girls.

In summary, the Sears-Iowa Doll-Play studies have provided an apparently extremely useful methodology in that the fantasy behavior shown in doll-play has showed consistent relationships to more difficult-to-observe "real-life" behavior. Results from the studies in general have been interpreted to support hypotheses derived by analog from behavior theory and applied to complex human verbal, fantasy, and social behavior.

Lewinian Field Theory

Modern field theory is perhaps best represented by Lewin and the topological movement. However, topological adherents are primarily engaged at this time in action and group dynamics research for which the theoretical relationship is very nominal. None of this later type of research is reviewed here, altho it represents interesting and useful work.

Lewin followed at least three major Gestalt principles: the irreducibility of at least some relations, both epistemologically and introspectively; the abjuration of an elementaristic and mechanistic science in favor of a doctrine of wholes (the individual as inseparable from his environment); and, as a derivative of this, a modification of the classical Gestalt isomorphism (Lewin's isomorphism seems to have been a correspondence between the psychological life space and "reality" or the physical life space). Additionally, he was relatively little concerned with problems of learning and antecedent conditions in the behavior theory sense of the word, but extremely interested in environmental forces as impinging on the individual and in problems of motivation.

A Representative Topological Study

Perhaps the most rigorously derived experiment of the topological series is Kounin's paper (41) on rigidity and satiation. Briefly, Kounin assumed from Lewinian theory that the mentally defective has life space regions separated by relatively impermeable barriers (a special case of rigidity being a function of CA). This being true, less co-satiation (satiation of adjacent regions as a result of a repetitive task) should occur for older feebleminded than for younger of the same MA, and less for the feebleminded than for normals with similar MA's. In general, experimental results were in line with theory. Kounin inferred strengths of the intervening variable of rigidity from antecedent conditions (mental deficiency of two durations as contrasted with normality). He specified the way

these antecedent conditions would influence the dependent variable and defined this dependent variable (rigidity) experimentally. There is, of course, only a very rough scaling of the antecedent conditions (old and young feebleminded and normals), and neglect of motivational factors which may have been introduced as a function of different durations of institutionalization or its lack. But despite criticisms which have been levied against this research, it remains one of the better examples of quite rigorously derived theoretical research.

The bulk of topological research has concerned itself with inferring a hypothetical life space from certain types of behavior elicited from defined types of situations (such as classical frustration, stress, autocracy-democracy, incompletion of tasks, and level of aspiration technics). The antecedent conditions which may influence the hypothetical life space typically have not been specified by other topological workers as they have been by Kounin. Hence generalizability of findings and predictability have suffered, altho many ingenious experimental procedures have been introduced into the literature. Topology in general has been of real heuristic value.

Some Theoretical Interpretations of Frustration Behavior

Perhaps the most widely known treatment of the concept of frustration is the frustration-aggression hypothesis proposed by the Yale group (19). Briefly, this theoretical position has maintained that the "strength of instigation to aggression" is related, as far as antecedent conditions are concerned, to (a) the strength of the tendency to make the frustrated response, (b) the extent to which the response is thwarted, (c) the number of frustrated response-sequences, and (d) the strength of competing tendencies resulting from the anticipation of punishment. On the consequent side, the authors have been concerned mainly with the occurrence of aggressive behaviors, but it should be noted that they did not, as is widely believed, propose that aggression was the sole consequence of frustration.

Lewinian theory, as developed by French (24), proposed that an emotional stage called "frustration" results when two opposing forces, one of which is a restraining force, are present. On the antecedent side the strength of this state is a function of the strength of the weaker of the two forces when the weaker is greater than a certain minimum. Among other things, the emotional state is said to lead, consequently, to aggression, regression, physical strain, and tension.

Recently, Brown and Farber (8) formulated a theory of frustration couched in Hullian terminology which warrants careful consideration. Frustration is conceived of as a hypothetical state or condition of the organism (as contrasted with the situation or event which produces the state) developing under any circumstance which hinders or prevents the occurrence of a response, and is shown to result, specifically, from either (a) the simultaneous activation of two competing excitatory tendencies

(sEr) or (b) the presence of a single excitatory tendency (sEr) and an opposing inhibitory one (sIr). The two major effects of frustration, according to the theory, are the production of an irrelevant drive (D) which combines with the relevant drive (D) to produce the effective drive (D), and the generation of frustration stimuli, which may have innately associated response tendencies or new associative connections acquired thru processes of learning. The nature of the one or more observable responses which appear consequently depends on the relative strengths of their excitatory tendencies. Admittedly incomplete, the theory is nevertheless of considerable importance, to the degree that it can generate a large number of hypotheses that can be tested empirically.

Additionally, Sargent (71) has published a general, critical, and evaluatory paper, and Lazarus, Deese, and Osler (45) have very recently published a general summary of findings with reference to stress. These papers, along with the two mentioned above, approach the problem from different theoretical points of view, but are in general agreement on several points: (a) that frustration is emotion, (b) that frustration research provides support for the notion of schematizing frustration as an intervening variable, and (c) that research work deriving from a theory of frustration is basic to the psychology of learning and personality. The Brown and Farber (9) paper provides, in addition, a valuable criticism of various theories of frustration (Lewinian frustration-regression and Maierian frustration-fixation theory, among others).

Topological Frustration-Failure Studies

The frustration-failure experiments, like the doll-play studies, relate to modifications of field theory, to the frustration-aggression hypothesis, which is related to behavior theory, and indirectly to psychoanalytic theory. Some of the studies have already been reviewed as a part of the section on the Sears-Iowa Doll-Play studies.

French (24) and Wright (95) both worked within the topological framework, the former with groups of male adolescents, some precollege, some in college. He studied the effects of an organized group (boys and young men who had known each other prior to the experiment) as opposed to an unorganized group (young men unknown to each other prior to the experiment). The former showed more equality of participation, more interdependence, more attack on obstacles and barriers, less social restraint, and other representative behavior. Wright's study with preschool-aged children exposed to frustration in the presence of (a) strong and (b) weak friends, and (c) in isolation, is too well known to be reviewed in detail. Briefly, frustration decreased constructiveness most when the child played alone and least when he played with strong friends.

Even better known is the classical frustration-regression study of Barker, Dembo, and Lewin (5) in which frustration markedly reduced the constructiveness of play, as rated from protocols, of preschool-aged children.

Another familiar study is that of Meyers (54), where the effect of different degrees of agreement and conflict between adult commands upon preschool children's behavior was analyzed.

None of these studies is particularly crucial for topological theory; all furnished ready generalizations for the social scene (with attendant possibilities for the carrying of excess meaning); all were ingenious.

Frustration and Training

A second type of frustration-failure experiment involved the investigation of previous experience upon reactions to failure. Davitz' (18) recent paper is a relatively good illustration of the procedure, altho some of the generalizations he made from the study and some of the applications to existing theories he formulated were questionable. Briefly, he trained two groups of children differentially. One group was trained in a cooperative fashion prior to frustration; the other group was trained to compete aggressively against each other prior to frustration. No pretest differences in cooperativeness and aggressiveness existed, but differences after training were significant in the predicted direction.

Davitz concluded that he had provided evidence counter to the Sears and others frustration-aggression hypothesis, the Lewinian frustration-regression theory, and the Maier frustration-fixation hypothesis, but that his data supported Shaffer's frustration-adjustment considerations. Insofar as the last-named regards learning as influencing frustration behavior, it is supported. However, none of the other theories of frustration disregards learning, particularly the frustration-aggression hypothesis which is rooted in reinforcement learning theory. The present authors feel that the study is a useful one, but that it is not theoretically crucial in any sense other than that it demonstrates the influence of previous positive reinforcement and previous building up on inhibition of instigation to aggression, upon frustration-produced behavior.

Goal Attainment

Filer (23) recently published a well-done, theoretically grounded paper in this area. His hypotheses were that a goal object obtained as a result of conditions which the subject thought demonstrated real ability on his part would increase more in attractiveness than one the attainment of which was believed not to involve such merit; that where no expectation of gaining the goal object was held, its gain in attractiveness would be greater than when its attainment was expected; and more inclusively, that attainment would produce increments in object attractiveness whereas failure to attain would produce decrements. Only the last of the hypotheses was substantiated. There were only inconclusive differences between well and poorly adjusted subjects as judged by the California Test of Personality. Second- and third-grade children, 160 in number, were used as subjects.

Frustration-Aggression-Repression

Graham, and others (32), in a study of 106 adolescents by the use of verbal "incomplete situation" technic, supported the frustration-aggression hypothesis that the strength of instigation to aggression in an individual is a function of the strength of the stimulus to aggression, where this latter is not sufficiently threatening to inhibit aggression thru fear of punishment (as of course it would not be in the hypothetical, verbal situation used by these experimenters).

Rosenzweig (65, 66), Sanford (68), and Sanford and Risser (70) explored the "remembering-forgetting" behavior of children (and, in some case, adults) confronted with tasks designed to present "ego-threat" (hence to produce ego-defensive behavior). They also studied simple blocking, presumed to elicit need-persistive (or continued-attack-on-the-problem) behavior. There has been some disagreement between Rosenzweig and Sanford with reference to the preferential forgetting of incompleted (failed) tasks as opposed to completed (successful) tasks. Sanford (68) considered the data carefully and apparently has reconciled their findings with the general conclusion that failures are more likely to be remembered with advancing mental and chronological age (presumably accompanied by increasing ego strength); and that successes are preferentially remembered at the earlier mental and chronological ages. In general, there seems to be more self-defensive forgetting (that is, forgetting of failures) for tasks designed to be ego-involving, particularly where the need to regain self-esteem is maximized and the possibility for achieving it is minimized.

Miscellaneous Frustration Studies

Thiesen and Meister (85) used well-quantified and controlled methodology with 10 children. They found that those children with the highest levels of aspiration showed the most severe reactions to frustration as evidenced by maladaptive behavior; the less well-adjusted showed more maladaptive reactions than the better adjusted.

Gatling (26) tested certain deductions made from Rosenzweig's extra, intra, and impunitive theory of frustration, that is, that a group of delinquents (who are, traditionally, "actor-outers") would show more extrapunitive responses following frustration than would a group of nondelinquents. His data showed the former to be extrapunitive as a group, the latter intrapunitive.

Finally, Sherman (77) tested the hypothesis frequently advanced that schizophrenics are nonreactive to their environment, normals intermediate between them and neurotics, and the neurotics hyper-reactive, but inappropriately so. He investigated the "frustration thresholds" of normal, neurotic, and schizophrenic children and adults, using as his criterion of frustration threshold the task difficulty level at which disruption of inte-

grated behavior occurred. In line with his predictions, the schizophrenics showed the highest threshold level, the normals were intermediate, and the neurotics lowest and most variable.

Summary of Frustration Studies

It is the opinion of the authors that the area of frustration-failure includes some of the most carefully done and fruitful theoretical experiments in the field of child psychology. The tendency seems to be for the experiments to be increasingly theory-oriented; some excellent general theoretical papers which should prove useful guides for future research have resulted from consideration of the research. The most hopeful future development would seem to be a concentration on theoretical research.

Level of Aspiration Studies

Level of aspiration concepts have resulted in considerable research with children. This research was reviewed by Lewin, Dembo, Festinger, and Sears (48) up to approximately 1943. Three representative later studies with children serving as subjects have been chosen for summary here.

Adjustment and Level of Aspiration

Two of these studies considered adjustment and level of aspiration. The first, by Gruen (34), involved an upward selected population at the upper and lower extremes of adjustment as indicated by the *Rogers Test of Personality*. She failed to give the sex distribution for the two criterion groups. She found significantly lower mean D-scores, but consistently higher mean average D-score deviations for the poorly adjusted as compared with the well adjusted. She concluded that the former showed compensatory and/or failure-fearful reactions to failure characteristically. Only the maladjusted group showed negative discrepancies. The well adjusted were more realistic. The study contains some misuse of the chi-square statistic; failure-reaction conclusions were based on them.

Escalona (22) in a study of children from two schools with very different curriculum orientations, using graded puzzle series, arrived at results relatively close to Gruen's. In a provocative section of her monograph she made a field theoretical analysis of her results and their implications. Neither the sexes nor the schools were evenly distributed in her well-poorly adjusted groups, and few statistically significant results were obtained on which the relatively broad generalizations were based.

Goal Attainment and Level of Aspiration

Child (14) in a study departing in part at least from topological "barrier" theory, investigated children's preferences for easy versus diffi-

cult goals. He found that with increasing age, children tended more to choose difficult goals; women experimenters produced more attempts, relatively, at difficult goals than men experimenters; availability made distant goals more attractive than when the pathway was less available; and boys more than girls strove for the distant goals. Child pointed out some sociological determiners arising thru communication, but these factors were not thought seriously to affect the results.

Summary of Level of Aspiration Research

These studies point out the fact that level of aspiration studies are not yet soundly anchored in theory. The concept, level of aspiration, remains an appealing one for several reasons: the possibility of assigning excess meaning is always present and unusually tempting because of the similarity between the operations involved in the typical experiment and "real life" situations; this similarity, itself, is another reason for the popularity of the experiment; finally, the technic permits the study of "organism plus environment" in quantifiable fashion. It is not to be gainsaid that the concept and technic remain of heuristic and experimental value.

Personality, Prejudice, and Perception

Linked with field theory are the two groups of papers which might, respectively, be labeled as: (a) personality and prejudice, and (b) personality and perception. The former is considered by many to be a special subheading of the latter. Both areas are popular with socially-oriented, field-theory-oriented psychologists at this time, altho relatively few finished research papers dealing with children have been published so far. In one or two papers the problem area has been approached from a behavior and learning theory point of view, but most of the studies are field theory oriented.

Prejudice and Rigidity

The general hypothesis that extremes of prejudice are associated with rigidity and intolerance of ambiguity arose in large part as a result of investigations carried on at the University of California with adults. Frenkel-Brunswik and her students have tested some of these hypotheses with children. The results of the intensive research which that group of workers has done with children are not at this time sufficiently reported in the literature to be reviewed in any detail. However, a representative paper is the informal summary given by Frenkel-Brunswik (25) where she reported on a number of minor experiments on memory as well as various tests of rigidity and perceptual ambiguity. She stated that her data indicated that the ethnocentric child showed in general a severe

repression of such feelings as aggression toward authority, weakness, fear, and elements of the opposite sex in oneself. She further observed that this was paralleled in an externalized image of these tendencies, which was projected onto others, and in narrowness and rigidity.

As has been indicated, the research data have not been reported in sufficient detail to permit critical review or a data-based evaluation of her general conclusions.

Rokeach (63) reported results tending to support Frenkel-Brunswik's hypothesis of an association between rigidity and high ethnocentrism. This paper was vigorously criticized by Luchins (50), to which criticism Rokeach returned a point-by-point rebuttal (64).

Kutner (43) concluded that "highs" as contrasted to "lows" ethnocentrically speaking tended to generalize too broadly and rapidly, tended to think in categorical terms, practiced cognitive distortion in the direction of simplying and fractionating complex and difficult concepts, and tended toward low tolerance for ambiguity and failure. There were no intellectual differences for a selection of 54 of the 60 children tested. The procedures used to define rigidity were a Weigl-type concept formation test consisting of four deductive and four inductive type riddles (the "highs" doing less well on the latter), and a spatial localization problem. Statistical significances are not given in the paper available for review, but inspection of the data reported indicates that the differences seem to approach significance. Kutner concluded that his data supported the Frenkel-Brunswik and Rokeach hypothesis about the personality correlates of ethnocentrism.

Cowen and Thompson (16) made a more general test of the hypothesis that rigidity is a pervasive personality phenomenon. Their findings supported only very tentatively the generalization of rigidity as a personality characteristic. Matched groups of rigid and nonrigid children (in terms of an Einstellung type test of rigidity) were administered the *Bell Adjustment Inventory*, the *California Test of Personality*, and the Rorschach. The first two revealed no group differences. The Rorschach provided certain results which tended to support the rigidity hypothesis: that is, the nonrigid children at a statistically significant level gave more responses, took less time per response, and took less time to organize their first response. Other differences were found, but the present authors believe that these were a function of the large differences in mean total Rorschach response between the two groups.

By far the majority of the large and extremely interesting literature on ethnocentrism and personality correlates has utilized the ubiquitous college student as a subject and has therefore been excluded from this review. There exist extremely marked discrepancies in apparently similar populations subjected to reasonably carefully worked out experimental designs, and far more research is needed before clear-cut empirical conclusions or theoretical applications can safely be made, either from the literature on children or adults. The social urgency of the topic should prove to be an incentive to production of more research.

Need and Perception Studies

The "perception-personality" studies have in common the general principle that needs result in selective perception, including distortion in the direction of need gratification. As with the personality-ethnocentrism papers, the great majority of research has dealt with adult subjects and falls outside the scope of this review.

Bruner and Goodman (9) tested three hypotheses: (a) The greater the social value of an object, the more suspectible will it be to organization by behavioral determinants (needs, previous learning, and adaptive mechanisms in general). (b) The greater the individual need for a socially valued object, the more marked will be the operation of behavioral determinants (accentuation in this case). (c) Perceptual equivocality (ambiguity) will facilitate the operation of behavioral determinants only insofar as equivocality reduces the operation of autochtonous ("innate" perceptual processes) determinants without reducing the effectiveness of behavorial determinants.

These hypotheses were tested on 30 ten-year-old children, 10 rich, 10 poor, and 10 who were used as controls. Estimates of the sizes of coins with the coin present and absent were made by the experimental children; equally-sized cardboard discs were used for the controls. The technic was manipulation of a lens which focused an approximately circular beam of light on the screen. The experimental results supported the hypotheses, particularly with the coin present.

Carter and Schooler (10) replicated the experiment, refining the methodology and design, and produced some results deviating extremely from Bruner and Goodman's. They used 48 children, nine to 11 years of age, 24 of whom were rich, 24 poor. Briefly, altho every estimate of five coin sizes made with the coin present showed the poor group estimating coins as larger than the rich, only one difference approached significance. In addition the poor group actually estimated two of the five coins smaller than their true size. Approximately the same results occurred when estimates were made from memory. For four of the five aluminum discs, the same size gradient as the coins, the poor children made smaller estimates than the rich, as was true for five of the five cardboard discs. None of these differences remotely approached significance, however. One of the most marked tendencies for both rich and poor children was the tendency to underestimate the small circles, whether coins or discs, and to overestimate the large. Three significant F ratios, two of them in the direction of the Bruner-Goodman hypothesis, were reported: (a) Poor children, from memory, tended to report coins as being larger than did rich children. (b) Poor children made a larger mean estimate when asked to estimate the size of an aluminum disc just larger than the paired coin than did rich children. (c) Small objects were underestimated, larger objects were overestimated.

Mausner and Siegel (53) worked from a somewhat similar hypothesis:

the higher the value of an object, the more quickly it will be perceived. They used a tachistoscopically presented series of postage stamps of different purported value, and an adolescent stamp collecting population. The results failed to support the hypothesis.

One of the earliest studies of the effects upon perception of a need was Murray's classical study (57) in which five girls rated photographs as less "good" after a game of "murder" played in the dark than after a pleasurable activity in the sunshine. Another early study was Sanford's (69), where he found that 10 children gave more food responses to a controlled word association list and to ambiguous pictures just before than just after a regular meal.

Learning and the Need-Perception Hypothesis

In none of the experiments quoted in the section just preceding have antecedent conditions been considered except in a rough way (hungry versus nonhungry, rich versus poor, for example). However, Lambert, Solomon, and Watson (44) combined the interests of learning and behavior theory with some of the experimental technics of field theory in one of the more interesting experiments in this area. Their experiment was one concerning secondary reinforcement. Children, all of preschool age, were trained to turn a crank to receive white poker chips, which when placed in a slot delivered candy automatically. Control children performed identically but received the candy without the mediation of the poker chips. The children, with a dial device for controlling the size of a spot of light, estimated the size of the poker chip at the beginning of the experiment, after a series of 10 days of positive reinforcement, again after a single extinction day (no candy), and after one day of resumption of reward. An analysis of variance proved significant for the experimental children: (a) From the first to the second test, a significant increase in estimation of size of the poker chip occurred. (b) After one day of no reward, a significant decrease in estimation of the size of the poker chip occurred. (c) A significant increase in the estimated size of the chip occurred after the day's resumption of reward. None of these differences approached significance for the control group. The general conclusion was that the principles of secondary reinforcement seemed to operate in this situation. An even more general conclusion was that the data supported the hypothesis which provides the core of this section: need influences perception. The study is a valuable one, additionally, in that it is an example of bridging the artificial chasm between field and behavior theory, in that by implication there is some demonstration of the learning both of needs and of complex perceptual behavior.

Without confining himself to the experiments reviewed here, Pastore (59) directed a strongly critical paper against seven of the need-perception studies. He took two tacks, one methodological and quantitative, and the other theoretical. The authors of this review regard the first of the two—

the criticism of methodological flaws—as legitimate and constructive, the second as somewhat tangential. Chein, and others (13) replied to his critical paper more or less point by point, giving a rather reasonable rationale for their methods and an effective one for the theory.

Summary of Need and Perception Studies

As with so many of the field theory studies, the need and perception studies have abounded in ingenious technics which appear to mirror socially meaningful and common human social situations. Typically, antecedent conditions have been lightly stressed. This represents one of the major differences between field and behavior theory studies. One of the most hopeful trends in this area of experimentation seems to the present authors to be represented by the Lambert, Solomon, and Watson (44) paper where antecedent conditions were manipulated and additionally "cross-sectional" or "field forces" were studied, thus helping to bridge the theoretical and methodological gap between field and behavior-learning research, without doing violence to either. In general, considerable confusion exists in the area, which is one of marked social and theoretical usefulness.

Reviews of Psychoanalytic Verification Studies

Two reviews of psychoanalytic verification studies, Sears's (74) general one, and Orlansky's (58), which is restricted to studies with reference to infant handling, have been published, in 1943 and 1949 respectively. In the first Sears reached the conclusion that due to the methods used in psychoanalysis (verbal recall), direct verification studies were almost impossible; but where hypotheses tested by behavioral observation were made explicit (for instance, in the area of regression) moderately positive results had been obtained. In the second review, the conclusion was reached and rather exhaustively documented that no substantial evidence for the psychoanalytic paradigms of infant care and training had resulted from research in the area. Readers interested in psychoanalytic verification studies are referred to the full treatments given in these two publications. This review, in general, is concerned with more recent articles and with verification studies done, for the most part, only with children.

Infancy and Environmental Feeling Tone Studies

Lowrey (49) studied children admitted to the psychiatric service of the Brooklyn Hebrew Orphan Asylum, after having been residents for some time in conventional infant wards. He noted much disturbed behavior and recommended a "cushioning" group—residence in a semitherapeutic small group "home" such as he operated before home placement. This, he

believed, produced real reversals in the adjustment of the children whom he described.

Levy (47) investigated the developmental status of children who had had more or less prolonged stays in infant nurseries as contrasted with children who primarily had lived in boarding homes since birth. Generally, the longer the infant ward placement, the more retarded the children. All trends were in the predicted direction, altho not all were significant statistically.

Spitz (80, 81, 82) has published a series of papers referring to children who have spent material amounts of time in infancy in infant wards, finding them much retarded where no consistent "mother figures" were present. This retardation was attributed by Spitz to lack of emotional relationships with a meaningful adult, either due to such a figure being totally absent or very inconsistent. Subsequent publications, based on clinical observations (79) documented head banging, anaclitic depressions, etc., as resulting from varying patterns of maternal-infant interrelations, or their lack.

Unanswered questions about the Spitz research, challenging as it is, have to do with: (a) the great difference in Development Quotient according to socio-economic level in the first year as reported by Spitz where such differences have not been found in infant intelligence test normative studies, where the methods of scale administration were more carefully described; (b) in ascribing to lack of emotional relationship the retardation of developmentally depressed groups, where the ascription could be equally pertinently made to the factor of sheer lack of stimulation and experience; and (c) finally, to the nonquantitative methods of study used.

Goldfarb (27) reported on an experimental group who entered an institution at the mean age of 4.5 months, remaining for an average of three years and three months. A closely matched control group of slightly less adequate heredity, in terms of mothers' occupational status, was used, who had essentially life time experiences in families (10-14 years). Foster homes were reported to be equivalent socially, economically, and culturally. The administration of the Rorschach test to the two groups, with chi-square analysis of the data, showed 7 of 21 categories to differ significantly (P = 5 percent or less) for the two groups. In general, as far as the attribution of adjustmental significance to these differences by Rorschach experts is concerned, the children who had spent long periods of time in the institutions were inferior to those who had spent the time in family homes. Illustrative differences were five institutional children of seven showing CF greater than C as compared with one of the foster children from nine available for analysis; three institutionally reared children, but no foster children showing pure C responses, etc.

This paper has been reported also apparently by Goldfarb (28) and by Goldfarb and Klopfer (29). The critcisms of the paper have to do with questions of reliability of interpretation and scoring of the Rorschach, the uncritical equating of Rorschach signs to other behaviors defining

goodness or badness of adjustment, the degree to which knowledge of the group to which the child belonged may or may not have influenced Rorschach interpretation and scoring, and the clinical usefulness of the results for dealing with an individual case.

Finally, Holway (38) found an insignificant rho coefficient between maternal reports of feeling tone and reality behavior of their children on a Sears-Iowa type play interview. She also demonstrated a relationship between feeling tone and fantasy, altho both rhos were in the predicted direction (+.38 and −.34 respectively).

Altho the methodology of these studies has been generally faulty and altho the authors infuse values into the discussion sections of their papers, the comparability of the results (constituting in a loose sense validation by replication) cannot but affect the practical worker with the very young child in the direction of utilizing extreme caution before recommending protracted residence in an infant ward.

Specific Infant Handling Practices

Orlansky (58) has reviewed this literature intensively. Representative papers include those of Maslow and Szilagyi-Kessler (52) in which a curvilinear relationship between duration of breast feeding and scores on a security-insecurity test was found. College-aged male youth, mostly second generation American, secured data on their own upbringing from their mothers, and also took the security-insecurity test. Peterson and Spano (60) found no relationships between breast feeding, maternal rejection indications, or child personality.

Goldman (30) reported that early weaning from the breast (up to four months) as opposed to late weaning (five months or more) tended to result in "oral pessimism" to the extent of a correlation of .27 for 100 adult subjects. Goldman's data concerning weaning was gathered from mothers of the subjects and from rating scales for 19 traits from the subjects themselves. Late weaning showed a correlation of .37 for the same subjects, and the same type of data collection was utilized. This study had many of the defects of the Maslow-Szilagyi paper, and the degree to which weaning data were known at the time the oral-pessimism-optimism scale was devised is not reported. Additionally, the correlations, while significant at less than P = 1 percent for this N, are not materially constructive in individual prediction.

Goldman (31) also reported that factor analysis of the 19 traits mentioned above revealed two factors, the first of which was significantly related to early weaning but poorly saturated with impulsion, aggression, and autonomy, which traditionally are associated with oral character. The other factor, highly saturated with these traits, was not related to early weaning. The author suggested that early weaning and a combination with impulsiveness-aggression may promote the development of oral pessimism.

Davis and others (17) reported on 60 babies divided into three equal groups, one fed by cup, one by bottle, and one by breast during their first 10 days. A sucking test, observations of spontaneous oral activity, time samples for crying, and evaluations of enjoyment of food composed the data. Psychoanalytically, it would be predicted that the cup-fed babies would show more nonnutritional sucking and more emotional disturbance than breast- or bottle-fed babies. Learning theory would predict that the latter two groups would develop more sucking behavior, regardless of type, than would the cup-fed babies. The breast-fed babies did develop stronger sucking reflexes than the other groups, which were not significantly different from each other. There were no group differences in spontaneous oral activity or amount of crying, altho the breast-fed babies showed slightly higher general body activity in their last five days and slightly poor appetites on the first three days. The study in general is carefully done methodologically but fits poorly with both straight psychoanalytic and learning (analogical) predictions.

Sears and Wise (76) found that late weaning produced greater appearance of frustration-behaviors, that the oral drive to a degree was secondary, in that it was strengthened by prolonged sucking-type feeding, and that no conclusion as to advisability of types of feeding could be gained from their data. However, there was some suggestion that late weaning was related to a greater incidence of thumbsucking than early weaning (contrary to psychoanalytic predictions).

Thurston and Mussen (87), in another study done with college students and data about feeding practices gained from their mothers, found no relationship between TAT need-press oral scores and lack of infantile oral gratifications. If anything, the highly gratified group showed more traits judged to jibe with an oral personality than did the little-gratified group. The study was carefully quantified.

Holway (38) in the study mentioned previously found that three of the five relationships between degree of self-regulation which had been permitted, and the number of realistic play factors shown by preschool children were significant at less than the 5 percent level. Mean differences between five self-regulated and 12 nonself-regulated children in both reality play in a Sears-Iowa type doll-play situation (less for the nonself-regulated) and fantasy (more for the nonself-regulated) were significant at less than the 1 percent level. Sum of aggression-fantasy-tangential scores also differentiated between the two halves of the bowel-training distribution, as did division into long- and short-times breastfed for reality and fantasy scores.

Criticisms of the study include the small number of subjects and their extreme upward selection. Actually, the nonself-regulating mothers may, in terms of the Detroit Cornelian Corner philosophy, have felt very guilty about the way they had reared their children. There was at least one case of "contamination"—the experimenter knew the child's training background. Additionally, the 90 percent agreement in scoring protocols from

two observers, reached by the experimenter and a co-worker, was reached after discussion of each half-minute of the protocols and the rejection of an unstated number of half-minutes of data. What effect some systematic theoretical bias may have had on this procedure is unknown. Finally, rating scales used by the mother may have reflected subtle psychological factors in the mother quite unrelated to actual practices which she may have used with the infant, and, additionally, were of unknown reliability.

Bostock (7) studied relationships of breast feeding and toilet training to later enuresis, finding no relationship between the first and third. However, rigid toilet training was strongly associated with later enuresis, and type of toilet training was found to be related to acceptance of the child. An unpublished study by McCandless (51) showed a consistently significant relationship for two populations between type of toilet training (bladder control) and length of time required for the child to achieve control, where the more permissive training produced results more efficiently. The results of these studies, while not in opposition to psychoanalytic theory in their significant results, also fit easily with behavior theory and with the general pattern of results obtained from frustration studies.

Another study is relevant here, altho the subjects were not children but college students. Levy and McCandless (46) using electric shock for 45 young adults, approximately two-thirds of whom were women, and a modification of the Wisconsin Card Sorting technic, concluded as follows: that where a "pattern of behavior" was provided in a training series, even tho it later failed to fit or help in the solution of a punishing, undifferentiated situation, it transferred into still a third situation and increased accuracy of prediction of shock, and resulted in less frequent prediction of shock and quicker learning than was the case with a group where the punishing, undifferentiated situation was presented first and the "pattern of behavior" second. This latter group, actually, handled the third, or test situation, no better than a group which had had no "pattern of behavior" at all taught to them. The authors stated that, granted certain assumptions, "one may by successive stages of induction arrive at the stricture, 'Give the child techniques for solving his problems' " (46:525). Additionally, "Similar inductive steps would lead to the axiom relating the 'toughness' of childhood traumas to difficulties in later adaptive learnings" (46:525).

The results of this experiment were compatible with psychoanalytic postulations about the enduring effects of experiences occurring in a poorly structured situation, and, insofar as childhood may be thought of as a time when "structure" is less adequate than it later becomes, might cautiously be generalized to early childhood.

Sex Awareness, Identification, Parental Preference Studies

Freud's concept of the oedipus and general personality theory hypotheses that appropriate sex identification is essential for adequate, adult adjust-

ment, has stimulated much research. Little of this is experimental, and actually much of the writing in the area is purely speculative. Typical research is normative in type and is not considered here except for a representative sample or so.

Conn (15), for example, using play interviews found game preferences sex-typed in an overwhelming number of cases aged 4-13 years. Rabban (61) in a carefully done study found sex awareness developing rapidly with age after age three, with social class differentiations. The fourth and fifth years were times of rapid growth in clarification of sex role for lower-class boys, the sixth for middle-class boys. Lower-class girls accepted sex appropriate patterns by age six, but middle-class girls did not clearly sex-type themselves even by their eighth year. The mother was preferred by both sexes in the early years. Radke (62) presented data in detail about parent behaviors and preferences. Rabban cited these to account for some of the factors disclosed in his research. Weider and Noller (91), using children's drawings of human figures, curtailing the IQ range and prescribing the socio-economic class of their subjects, found both sexes drawing more sex characteristics (at a statistically significant level) for their own-sex figure the lower down the socio-economic scale they were classified, with a tendency shown in the same direction for the opposite-sex figure. This last tendency was not significant for girls. There were no significant differences between number of sex characteristics drawn into the figure for own sex-figure between boys and girls. Thus, to a degree, the Rabban findings were extended.

Erikson (21) studied sex differences in play configurations in approximately 150 preadolescent play sessions. His findings were considered by him to represent biological determinism, the play interests being analogs to the physiology and function of the sex organs. These conclusions were reached by inductive stages from independent judges' (two in number, one male, one female) classification of play incidents.

Ammons and Ammons (2) found preschool children's parent preferences were somewhat inconsistent. Contrary to oedipus theory, like-sex parent preferences were apparent at three years, and parents were differentially preferred, mothers for care, fathers for play and reading. Parent preference was also inversely related, according to which parent administered punishment. This study served to emphasize cultural determinism more than a simple and universal oedipal phenomenon, as do the interesting studies of Winch, of which 92 and 93 are representative. A questionnaire survey was made of more than 1000 midwestern college students, on the assumption that where the like-sex parent was missing from the home, heterosexual maturity (courtship behavior) would be retarded. In general, this hypothesis was supported by the men's but not the women's data. Winch also introduced social-learning phenomena to explain his results: courtship behavior for males involved breaking maternal dependency; but for women may have resulted merely from transferring dependency from father to husband.

Cass (11, 12) devised a highly objective measure of maternal awareness of the child and considered the existence of this awareness as a reinforcement to the child. She investigated the relationship between awareness and identification of the child with the mother, finding for a "normative" group of socio-economically upward selected boys and girls a correlation of maternal awareness and identification of .59 for girls and .17 for boys. She also found low awareness and high control on the part of the mothers to be significantly related to parent-child conflict, when compared with mothers showing high awareness and relatively high control scores. Cass's study provided an objectification of instruments and definitions rather unusual in the field, altho her instruments, as she recognized, were designed so as, in all likelihood, to lower boys' identification correlations. Her findings may be inductively considered to be in agreement with the predictions which could be made from psychoanalytic theory, or from a reinforcement type of behavior theory. Her preference was for the latter.

Finally, Stoke (83) in a constructive general paper which should be read by any person planning research in this area, criticized existing "identification" research and listed 10 factors which he believed influenced identification and which he thought could be objectified and verified.

Miscellaneous Psychoanalytic Verification Studies

Two studies, one on maternal labor designed as a test of the Rankian birth trauma hypothesis, Ruja (67), and one on maternal attitudes during pregnancy as related to adjustment in the first six months of the infant's life, Wallin and Riley (90), have not proved to be conclusive, and there were serious flaws in the designs of both.

Two recent allergy studies have been selected as representative of psychosomatic research. Harris and others (37), endeavoring to keep contamination at a minimum and to achieve a maximum of case history accuracy, reported on the hostility, crying, and confiding behavior of asthmatic and allergic rhinitic children. Teachers' ratings showed less open aggressive behavior for the asthmatics than the rhinitics and less for the asthmatics than for a control group of children who had been referred to another agency for problem behaviors. Rejection seemed significantly more frequent for the experimental than for the control group. Asthmatics also seemed to show greater difficulty in crying and in confiding in the mother than did the rhinitics.

The study fits approximately with the psychoanalytic theories of the dynamics of asthma, yet differing psychological dynamisms were not related to response to treatment (open expression of aggression theoretically should yield better prognosis for treatment). There were some difficulties also of selection of the subjects as far as the design is concerned. Finally, the comparability of the experimental and control subjects left much to be desired.

In the second study, Miller and Baruch (56) reported on allergic compared with nonallergic children referred to them for behavior difficulties. Significant differences were found in the direction predicted by psychoanalytic theory in direct, indirect, displaced and self-directed hostility between the two groups as far as office behavior, parents' reports, school reports, and separately statistized play sessions were concerned. Reliabilities of play interview observations were not reported, and room for unconscious biases in categorization of play, office, etc., behavior was left in the experimental design (presumably the experimenters were well aware of the diagnostic group to which the children belonged.)

Harlow (36) extracted 18 variables from a TAT and Sentence Completion Test which he related to psychoanalytic theory. He used these to "explain" men with extreme awareness of secondary sex characteristics, particularly musculature. Weight lifters, he believed, represented such a group, and 20 of them were compared with 20 nonweight-lifting athletes of similar general characteristics. Thirteen of the 18 variables distinguished significantly in the direction of prediction. Among his conclusions were listed failure of the weight lifters to identify with an adequate male, underlying dependency feelings, abnormally acute feelings of masculine inadequacy, and exposure from early in life to a depriving and frustrating environment, with excessive amounts of narcissism.

It is perhaps worthwhile to list the necessary logical steps in this paper, as the study was rather carefully done and the logical procedures necessary for it are relatively typical of studies or experiments purported to test psychoanalytic theory. These steps represent the present authors' analysis and were not stated by Harlow. First, the psychoanalytic definitions of several concepts, such as overcompensation, identification, repression, and narcissism must be set forth in general terms. These must then be translated into projective material content (in this case, the TAT and Sentence Completion Test). This, typically, is done by observer analysis and agreement. Next, by another set of operations (social behaviors) a group is chosen whose "core" behavior presumably represents another definition (or "outcome") of such concepts as overcompensation and identification (weight lifters in this case). If correlations between weight lifting and the TAT, SCT variables are found to be significantly positive, the inference is made that validation of the concepts of overcompensation, etc., has been achieved. Since these have now been supported, certain circumstances of childhood learning responsible for them are derived (assumed to have occurred); and, this last "being true," with the end results as measured, the psychosexual stage theory of personality development is held to have been validated and the criterion behavior (weight lifting) "explained." Such a process seemed to be what Sears (74) had in mind when he concluded that direct test of psychoanalytic theory is well-nigh impossible, and that more fruitful approaches should probably be used.

Studies of Childhood Memory

A keystone of psychoanalytic theory is the concept of repression, and one of the most frequent methods of studying repression has been the eliciting of early memories. Three studies are cited here as representative of the literature since 1941 when Dudycha and Dudycha (20) reviewed research on childhood memory. Waldfogel (89) asked adults to record as many memories as they could. His figures for pleasant versus unpleasant memories (50 and 30 percent respectively) were in line with repression theory, altho not to the predicted degree. But his conclusion was that the variety of memories and presumed early chronological age from which many of them date were factors that cast serious doubt on the theory of infantile amnesia (repression). He found that some individuals reversed the pleasant-unpleasant trend and suggested the terms of "memory optimist" and "memory pessimist." The method of accurate placement of the memory under consideration in this study, as in most, was dependent upon the subjects' statements, which in turn presumably were influenced by all the dynamics of condensation, distortion, repression, etc., which were being tested.

Thompson and Witryol (86) asked college girls to recall the unpleasant things which had happened to them in: (a) their first five years of life, (b) between 6 and 12, and (c) between 12 and 18. The 50 girls in each of the three groups were reasonably closely matched. A total of 721, 803, and 735 memories were recalled for each of the three age periods. This finding also reflects negatively on the notion of infantile amnesia, altho the method of age placement of memories is subject to the same criticism as was made above for Waldfogel's study. The authors' findings seemed to reflect social learning influences: the first age period produced a plurality of unpleasant sensory and emotional memories (41 percent); the second of unpleasant experiences during the process of learning to live in a social world (43 percent); and the third of experiences producing a sense of inadequacy and inferiority (46 percent).

Finally, Turner and Barlow (88), in a critical, methodological study involving introductory psychology students found that the order of requesting memories determined whether more pleasant or unpleasant memories were recalled (more pleasant if pleasant were requested first, and vice versa). They also demonstrated that the primary factor in recall seemed to be intensity, where the more intense experiences, regardless of their pleasant or unpleasant nature, were recalled earlier than less intense experiences. Questions concerning order of requested recall and degree of intensity have not been controlled adequately in most studies, and in few if any has accurate age placement of the memories been made.

The childhood memory area, in other words, has produced results which support moderately the psychoanalytic conceptions of infantile amnesia and repression; but the degree of fit manifested (that is, most studies have found more pleasant than unpleasant memories recalled) must be viewed

skeptically due to common methodological errors (and difficulties, such as age verification of a given memory).

In a study somewhat more directly designed to test the theory of psychosexual stages, particularly pregenitality as a presumed index of immaturity, Miller and Stine (55) judged the degree and stage of pregenitality represented in elementary-school children's endings to incomplete stories. In general, degree of pregenitality was negatively related to social acceptance as judged psychometrically. However, many isolates secured low pregenital scores. They were thought to be good "potential leaders" who at the time of the study were too mature for the group. High anality scorers also proved to be unexpectedly acceptable to the group. Anality is accompanied by behavior thought to be valuable in latency, according to the authors.

Summary of Psychoanalytically Derived Studies

It seems to the authors that psychoanalytic theory has stimulated some useful and interesting research; that this research has seldom if ever been a direct test of the theory (partly because the theory is so difficult to translate into testable concepts); that there have been many loopholes in the research which has been done; and that the adduced and tested hypotheses have fared little better than chance as far as support is concerned. There is also a serious question in the authors' minds as to whether those hypotheses which have been supported could not more economically have been derived from behavior theory, or reduced to it, as the case may be.

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[1] Corrected to December 1, 1952. Report errors immediately to the secretary-treasurer.

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§ Membership begins January 1, 1953.

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§ Membership begins January 1, 1953.

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§ Membership begins January 1, 1953.
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